ENGINEERING FINANCE COMMERCE

THE FAR EASTERN REVIEW

上海黃浦灘念四號

遠東時報

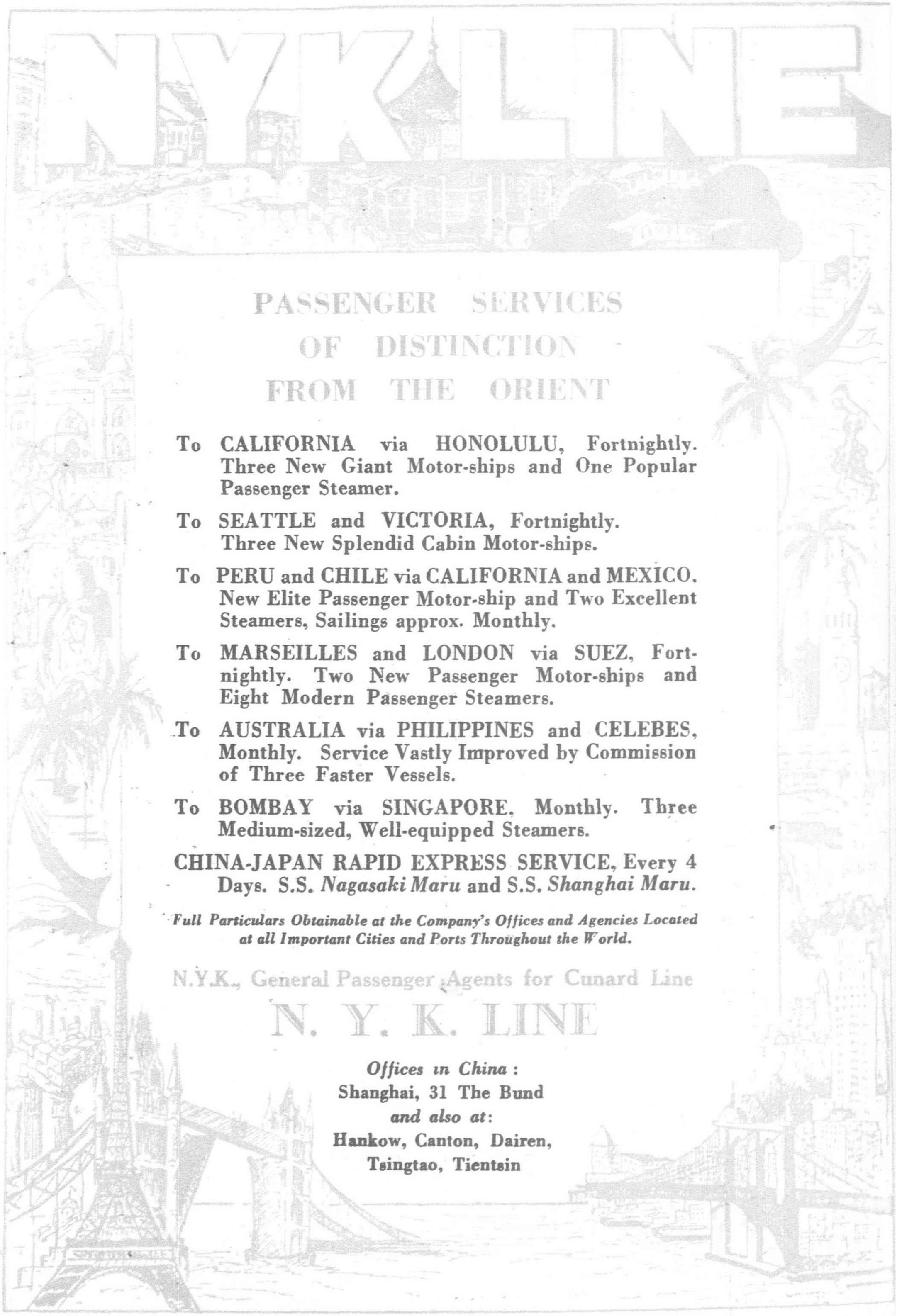
TREATY STATUS OF MANCHURIA

MATSUOKA'S FINAL WORD

REALITIES IN THE FAR EAST

RUSSIA IN THE METAL WORLD

Vol. XXIX MARCH, 1933 No. 3



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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XXIX SHANGHAI, MARCH, 1933 No. 3

The Treaty Status of Manchuria

By JOHN V. A. MacMURRAY, in The Annals of The American Academy of Political and Social Science

Honorable John V. A. MacMurray is Director of the Walter Hines Page School of International Relations, The Johns Hopkins University. He was a member of the American Diplomatic Service from 1907 to 1929, serving at American Missions in Siam. Russia, China, and Japan, and in the Divisions of Information, of Near Eastern Affairs, and of Far Eastern Affairs, of the Department of State. He was Assistant Secretary of State, 1924-1925, and Minister to China, 1925-1929. He is editor and compiler of "Treaties and Agreements With and Concerning China, 1894-1919" (1921).

In this tangled Manchurian situation, the issues are understandable only by reference to the treaty history of the country. And for our present purposes that history may be said to have begun a generation ago, with the war between Japan and China in 1894-95. Up to that time we can consider Manchuria as almost an economic and political void, despite its size and potential wealth and despite its geographical situation at the point where three virile peoples—Chinese, Japanese, and Russian—were bound to meet in the course of their national development.

Defeating China in war, the Japanese demanded various cessions of Chinese territory, including the southern tip of the Manchurian Peninsula, with its almost unexcelled commercial and naval harbors of Dairen and Port Arthur. But Russia, Germany, and France were unfavorably disposed towards this intrusion of Japan into the situation on the Asiatic mainland; and by a joint *démarche*, in 1895, they constrained Japan to forgo, in exchange for an additional indemnity, the Manchurian territory ceded to her under the recently concluded Peace Treaty of Shimonoseki.

Russian Interests in Manchuria

This conclusion is now manifest in retrospect as not only inconclusive but an aggravation of all the dangerous tendencies latent in the politics of the East. It left Japan embittered and determined to have the revenge against Russia which she actually achieved ten years later. It threw the politically helpless China into the arms of Czarist Russia—the European nation most disposed towards a policy of adventure and least capable of maintaining the rôle of a great imperial power under the new conditions that were developing.

The almost immediate result of the humiliation of China by Japan and of Japan by the European combination led by Russia, was that Russia offered China her support for the future in exchange for the right to build and operate through Manchuria, from west to east, a railway connecting the Trans-Siberian system with Vladivostok and the Pacific Coast region of Siberia by a short-cut considerably quicker and more easily operated than any available route through wholly Russian territory.

The noted Chinese Viceroy, Li Hung-chang, attended the Coronation ceremonies of the Emperor Nicholas II at Moscow in the Spring of 1896; and while there he was induced by Count Witte and Prince Lobanoff to sign a secret treaty of alliance. Out of this transaction grew a new situation: Not only was the original Chinese Eastern Railway built by an ostensibly private corporation which cloaked the interest of the Imperial Government, but Russia shortly obtained the leasehold, with virtually complete rights of administration and defense, of the very peninsula which she had led Japan to relinquish, and the railway concession was extended to include a north-and-south connection with the newly leased territory.

Thus, within three years of the treaty which recorded Japan's triumph over China and gave her a foothold in Manchuria, the whole position had been shifted: Japan had been ousted in favor of Russia to whom Manchuria had been opened as a military base and as a field for economic penetration.

Japan Strengthened Position

It was in this contingency that Japan, feeling threatened as well as humiliated by Russia's advance to shores closely neighboring her own, formed in 1902 the alliance with Great Britain which was for the next twenty years to be a major factor (although of varying influence) in the affairs of the Far East. The immediate effect of the Anglo-Japanese Alliance was to "hold the ring" for Japan in the contest with Russia which she conceived to be inevitable, and which was actually fought out in 1904-1905. You no doubt recall that Russia, overconfident and listless, divided by the first manifestations of revolution and hampered by operating over thousands of miles of single-track railway, was defeated by the Japanese, united in a common purpose of desperate patriotism and operating with the advantages of inner lines; and that, when both contestants were close to exhaustion, they were brought together by President Roosevelt for the negotiation of peace at Portsmouth.

The treaty signed at Portsmouth in the Autumn of 1905 did not indeed drive Russia out of Manchuria; but it gave to Japan all special Russian rights and concessions within the area of the campaign in Southern Manchuria—roughly a quarter of Manchuria, but the region of greatest economic and strategic potentialities. Once more the peninsula (henceforth to be known as the Kwantung Leased Territory) passed into Japanese hands, and with it the port of Dairen, which is the commercial key of Northern China. And there also passed into the hands of Japan several hundred miles of the newly constructed Russian railway terminating at Dairen, together with the large appurtenant rights. These transfers were in due course confirmed by separate treaty between Japan and China.

Strategic Importance of Manchuria

Here we may well pause to consider the nature and the extent of the interests thus conquered by Japan. Over the Kwantung Leased Territory she acquired a virtually sovereign right of administration for a period of almost twenty years. That territory afforded the only adequate port facilities on the shores of the Gulf of Chihli. It was connected with a rich agricultural hinterland by a railway easily converted into the best and most efficient in the Far East. Appurtenant to that railway were both coal mines and iron mines containing a considerable proportion of all the known deposits in Eastern Asia, and thus capable of supplying the comparative lack of such deposits in Japan.

These things give some indication of the importance of Japan's acquisitions in Manchuria; but they wholly fail to give an adequate

conception of the economic and political dominance which accrues to a railway that links a primitive agricultural people with the outer world of industry. Under such conditions a railway becomes the master of the destiny of the region. It is no wonder that the Japanese have regarded their railway system—the South Manchuria Railway—as the basis of their position in Manchuria, have stretched to the utmost in its favor every provision of the treaties, have treated its right of way as though it were the soil of Japan itself, have fortified and guarded and patrolled every foot of it with picked troops, and have at times accorded it the right to exercise actual governmental functions in the appointment of local consuls and in dealing with the Chinese authorities.

Nor is it to be wondered at that, in negotiating at Peking for the Chinese Government's confirmation of the Japanese conquests from Russia, the Japanese sought to obtain assurances that China would never build or permit the building of competing lines in Manchuria. Whatever may have been the degree of success of this attempt, it is unfortunate that any agreement reached on the subject has not been made public but has remained a matter of claims by the Japanese and denials by the Chinese. The Lytton Report gives for the first time enough information to warrant the surmise that the Chinese negotiators, without committing themselves to any concrete formula, did give in vague general terms some assurances that they would not enter into injurious competition with the South Manchuria Railway.

Economic Development Under Japanese

It was a rich field that Japan conquered from Russia in South Manchuria in 1905; and it is to her credit that she cultivated it diligently and ably. The transportation facilities were excellently developed; the workings of coal and iron were expanded to a point that perhaps erred on the side of optimism; and the trade in the soya bean was brought to such phenomenal growth that it constitutes a veritable romance of commerce. And without subscribing to the more exaggerated claims that would attribute to Japan everything good developed in Manchuria, one must in fairness admit that Japan did contribute materially to the productivity of the region and to the general economic betterment of the people of South Manchuria.

On the whole, moreover, I think that this development of Japanese interests was carried out without deliberate unfairness to the interests of others. Japanese had not only the advantages of proximity to the region and of similarity in language, but also those resulting from the greater suitability of their goods to a market of low purchasing power, the control of communications and the predominance in other accessory facilities to trade, the very great (although imponderable) influence of prestige, and a peculiar degree of clannish solidarity in the advancement of their business interests; so that it is not necessary to suppose that they "closed the door of opportunity in Manchuria," in order to explain the fact that the business of other nationalities ceased to thrive there after Japan became dominant.

As regards relations with the Chinese authorities, it is no doubt true that the growth of Japanese interests involved constantly increasing pressure—that the maintenance of the conditions which Japan considered necessary to assure peaceful and orderly functioning of the enterprises in which she had so great a stake led to frequent interferences with Chinese freedom of action, and even on some occasions to the overt use of force to modify the domestic situation.

Japanese International Agreements

Japan had indeed ventured her stake upon a condominium in which it was inevitable that she should consider it necessary to assure for herself a controlling position, even to the extent of asserting a dominant political status. And to protect that status from the possibility of encroachment by the other outside power most likely to contest it, Japan early reached an accord with Russia. As far back as 1907, within two years after the war, there was concluded (along with an innocuous public treaty proclaiming platitudes about respecting the *status quo* and the existing rights of all parties concerned) a secret treaty dividing Manchuria into spheres of interest and running a line between the spheres of Russian influence in the north and Japanese in the south.

This treaty was of a familiar type. On its face, and perhaps in intention, it was purely negative—a pact of renunciation and non-aggression by each party with respect to an area in which the interests of the other party were recognized as predominant. But by the mere fact of specifying areas within which the respective parties are declared (even though it be only *inter se*) to have a special status within the territories of a third power, such agreements have always held implicit in them the concept of special political rights which tend inevitably to evolve into claims to a general and exclusive superiority of rights in the territory in question.

Such was the course of development of the relations inaugurated by the secret agreement of 1907 between Japan and Russia. It was followed by three other such agreements, in 1910, 1912, and 1916, which transformed the original negative understanding into a mutual recognition of positive rights, extended to Inner Mongolia the scheme of spheres adopted for Manchuria, and in the end (during the World War) ripened into an out-and-out alliance against any power which might challenge the position of either of the parties as established by these secret agreements.

Side by side with this development of the relations between Japan and Russia, there had taken place a change in the character of the Anglo-Japanese Alliance. The original agreement of 1902 was revised in 1905, during the progress of the Russo-Japanese War, and again in 1911. The effect of these revisions was to transform what had originally been a purely defensive alliance into an understanding that, at least by implication, seemed to recognize, on the part of Great Britain, Japan's dominant special rights and interests in "Eastern Asia"—a phrase which, in its context, must refer to Southern Manchuria.

With France, too, Japan had in 1907 reached an agreement engaging "to support each other for assuring the peace and security in those regions of the Chinese Empire" which were "adjacent to the territories where they have the rights of sovereignty, protection or occupation."

Japan had thus obtained at least a degree of acquiescence on the part of Great Britain, France, and Russia, in her claims to a special position in Southern Manchuria, before the year 1909, when our own Government made the genuinely well-intentioned but rather unrealistic effort to obviate the contest for economic and political supremacy in Manchuria by proposing the internationalization of the railways. This proposal by Secretary Knox met a rebuff, at the instance of Japan, from all the interested powers except Germany; and it undoubtedly had the effect of urging Japan and Russia further in the direction of an agreement to divide the spoils in Manchuria.

Such, then, was the position at the outbreak of the World War in 1914: Japan had in South Manchuria, by conquest from Russia and by consent of China, a territorial base and a very great economic stake which had become vital to the commercial and industrial life of the home country, which of practical necessity involved political implications that there was a constant temptation to realize in derogation of the administrative and political independence of China, and which had obtained recognition in more or less definite terms by the three principal Allied Powers.

The Twenty-one Demands

This fabric rested, however, upon the basis of rights due to expire in a comparatively few years—the lease of Kwantung in 1923, and the railway rights in 1923 and 1929. It is easy to understand, therefore, that the Japanese considered it essential to their interests to obtain a prolongation of these terms. That they achieved in connection with the so-called Twenty-one Demands made upon China in 1915.

It would serve no useful purpose of this occasion to discuss the general legal and ethical aspects of those demands, secretly presented and negotiated, and in the end enforced by an ultimatum. They involved far more than a prolongation of the *status quo* in Manchuria; they went very near to the assertion of a dominant position throughout China.

But for our present purposes we need only note that the desired extensions of the Kwantung Leasehold and of the period of Japanese operation of the railway system were assented to by the Chinese at the very outset of the negotiations, and so were not among the issues of which Japan by the ultimatum demanded a settlement: nor were the demands for further mining concessions. In their bearing

upon the position of Manchuria, the essential fact is that the treaties arising out of the Twenty-one Demands confirmed Japan for a further period of some eighty or ninety years in the enjoyment of the very extensive set of rights which no realistically minded Chinese could have expected her to relinquish.

It was shortly after this episode that the fragile unity of the new Chinese Republic was shattered by the death of President Yuan Shih-kai ; and then began what is perhaps to be the century-long political agony of the Chinese people in the effort to find themselves as a nation. In the indiscriminate scramble for power that then ensued, the Japanese Government quite definitely and with little attempt at concealment gave its support to a particular group of Northern militarists, to whom it purveyed very considerable sums of money through the unconscionable series of loans made by an agent named Nishihara. These loans were ostensibly for constructive purposes such as the building of railways under Japanese supervision, and for Chinese participation in the war in co-operation with Japan ; but the proceeds were squandered by the Chinese warlords, and there remained the financial indebtedness of the Chinese Government and the set of concession rights established in favor of Japan by the loan agreements. It is scarcely going beyond the terms of a document published by the Japanese Finance Ministry of the day, to comment that the Nishihara loans were designed to create a situation in which Japan might in effect foreclose upon a profligate Chinese Government.

Position of The United States

One more step towards the establishment of her position in Manchuria, Japan was able to take before the World War came to a close. Of the Allied Powers chiefly interested in the Far East, the United States alone had not yet given any degree of acquiescence in Japan's claims to a special position in Manchuria. But in the Autumn of 1917, Viscount Ishii, Japanese Ambassador on Special Mission to the United States, concluded with Secretary Lansing an exchange of notes in which the latter stated that

> The Governments of the United States and Japan recognize that territorial propinquity creates special relations between countries, and, consequently, the Government of the United States recognizes that Japan has special interests in China, particularly in the part to which her possessions are contiguous.

Whatever may have been the import of this statement, it had at any rate the effect of creating alike in Japan and in China a popular belief that the United States had acquiesced in a Japanese purpose to make herself dominant in South Manchuria.

Such was not, however, the interpretation which the American Government placed upon the exchange of notes ; and during 1919 Secretary Lansing initiated negotiations with Japan, Great Britain, and France, with a view to the re-establishment of a financial consortium for Chinese business under terms which would, while leaving untouched the existing railway and other interests of the various powers in China, make possible the financial co-operation of all other interested nationalities in the further development of the resources of China.

The one difficulty encountered in the formation of this new consortium was that Japan insisted upon the exclusion of Manchuria as being her special sphere of interest. In the end, however, upon assurance that her existing rights would be construed to include certain specified lines of railway which were already under contract by Japanese nationals although not yet constructed, Japan consented to waive her contention that Manchuria should be considered upon a basis different from that of the rest of China. And although the consortium formed in 1920 has been unable to function because of certain political objections inherent in the Chinese domestic situation, it still has its significance in defining the limits of Japanese claims in Manchuria.

The Washington Conference

The unsatisfactory and restless situation created in the Far East by the World War and its incidents, including the Japanese occupation of the Province of Shantung, brought it about that the whole subject had to be taken under consideration in connection with the project for a limitation of naval armaments. That conference, consisting of the principal naval powers and those chiefly concerned in Far Eastern questions, was called by the Government of the United States, to meet in Washington in the Autumn of 1921. The linking of the two subjects was referred to in our Government's invitation, in which it was stated that

> the prospect of reduced armaments is not a hopeful one unless this desire finds expression in a practical effort to remove causes of misunderstanding and to seek ground for agreement as to principles and their application. It is the earnest wish of this Government that, through an interchange of views with the facilities afforded by a Conference, it may be possible to find a solution of Pacific and Far Eastern problems, of unquestioned importance at this time, that is, such common understandings with respect to matters which have been and are of international concern as may serve to promote enduring friendship among our peoples.

The conference dealt at large with a number of questions relative to China ; and in the course of its proceedings the Japanese Delegation renounced virtually the whole of those rights which had been acquired by the ultimatum following the Twenty-one Demands, except the claim to a right of settlement and agricultural enterprise in Manchuria. But the essence of the decisions of the conference, as embodied in the treaty relating to principles and policies concerning China, is the self-abnegating agreement

> to respect the sovereignty, the independence, and the territorial and administrative integrity of China, to provide the fullest and most unembarrassed opportunity to China to develop and maintain for herself an effective and stable government, to use their influence for the purpose of effectually establishing and maintaining the principle of equal opportunity for the commerce and industry of all nations throughout the territory of China, to refrain from taking advantage of conditions in China in order to seek special rights or privileges which would abridge the rights of subjects or citizens of friendly States, and from countenancing action inimical to the security of such States, [and further] not to enter into any treaty, agreement, arrangement, or understanding, either with one another, or, individually or collectively, with any Power or Powers, which would infringe or impair the principles stated [above].

The whole of the negotiations and of the resulting agreement took cognizance of the fact that China then, as now, was an entity deficient in political development, upon whose weakness the powers mutually undertook, in their own interest, not to trespass. And although in the course of the deliberations the Japanese Delegation did quite properly take occasion to emphasize the importance of its interests and the particular degree of concern with which it was compelled to regard Manchuria because of economic and strategic considerations, there was no intimation of a desire on its part to have Manchuria, or any portion of it other than the Kwantung Leased Territory and the zone of the South Manchuria Railway, recognized as possessing a status which would in any degree distinguish it from the rest of China as regards the self-denying ordinances which the powers concurred in imposing upon themselves by the Nine-Power Treaty. And no treaty or agreement that has been concluded since the Washington conference (at any rate up to the time of the recognition of Manchukuo by Japan) has imported any alteration into the legal status of Manchuria as recognized by that treaty.

This, then, has been the situation : Japan has, by treaty arrangements, been in legal possession of the cream of the business of South Manchuria—of the principal means of transportation, of the bulk of the mineral wealth, and of most of the facilities for import and export trade ; and, effectively enjoying three-fourths (let us say) of the economic rights and opportunities of the region, she has been under pledge, to China and to the other interested powers, not to resort to encroachment upon the territorial and administrative integrity of China in order to gain an even further share.

Balancing The Pros and Cons

The discussion of the treaty status of Manchuria might logically end here ; but it seems to me neither realistic nor fair to construe the topic so narrowly as to ignore some relevant aspects of China's general treaty relationships.

No view of the present difficulties in Manchuria can be complete that does not take into account the fact that of late years, under the stimulus of a strong nationalistic movement, China has been refusing to be bound by treaty obligations that seem to obstruct what she conceives to be her national destiny. In pursuance of that policy, she has declared the abrogation of a considerable number of her treaties with foreign powers, in disregard of their provisions ; and among them she thus denounced, in 1928, the basic treaties of friendship, establishment, and commerce (those of 1896 and 1903) between herself and Japan.

The treaties relating to Manchuria (as indeed may be the case generally with such international arrangements) are in the long run significant not so much because of their establishment of new rights and legal situations as because of their having confirmed and recorded situations agreed to have come already into existence. And there may be read in them, as so viewed, the confused and rather tragic and sordid story of a conflict in which the formal documents—agreements, declarations, demands, protestations, and appeals—merely cloak the interplay of crude human passions. One familiar with the story cannot take with great seriousness the claims of either contestant to a clear record of impeccability. I wish it were possible for me to entitle myself to your gratitude by making easy for you a simple decision, in your own minds, as to which side is right and which is wrong. But human conduct—at any rate in so complex a situation—is not amenable to any such facile judgment; and the only conclusion I can offer you is that it behooves us, in a spirit of good will towards both the powers concerned, to confront the practical question without emotional bias of partisanship for or against one contestant or the other.

Matsuoka's Final Word

Disorganization in China, He Says, Is the Real World Problem

In his closing address before the Assembly of the League of Nations at Geneva on February 24, Mr. Yosuke Matsuoka presented in simple forceful terms the final statement that foreshadows Japan's withdrawal from the League. The text of this notable address is given as follows:

"The Japanese delegation has notified the Assembly that it disagrees with the draft report prepared by the Committee of 19 and cannot accept it. It is hardly necessary for me to say that the Japanese Government has given careful and serious consideration to this document and that it is with sad disappointment that it has come to this conclusion.

"One outstanding feature that is noticeable throughout the draft report is the failure on the part of the Committee of 19 to realize the actual situation in the Far East, the difficulties of Japan's position in the midst of unparalleled and appalling circumstances, and the ultimate aim that is impelling Japan in her action.

"For over 20 years, China has been going through a revolution which has brought disaster to her people. Tens of millions of people have lost their lives as the result of internecine warfare, tyranny, banditry, famine and flood; hundreds of millions of them have been plunged into misery and despair. With the armies of Communists ranging over a wider territory than the Nanking Government controls, a condition of chaos reigns throughout the country. Such distress and misery as exist among the Chinese people are beyond the imagination of the average man or woman living in Western countries. And the end of this catastrophe is not in sight. No one can foresee how long it will continue.

"The fundamental cause of trouble in the Far East lies in the lawless condition in China, the impossible reign of self-will in that country, without recognizing on her part her obligations to her neighbor, China has long been derelict in her international duties as a sovereign State, and Japan, as her nearest neighbor, has been the greatest sufferer on that score.

"Since the beginning of the revolution which has shattered China into parts, all of what were called, under the Manchu dynasty, dependencies of the Empire, have been lost to the Republic. Over

JAPAN'S LAST NOTE TO THE LEAGUE

The following is given unofficially as the text of the note in which Japan formally withdraws from the League of Nations:

"The Japanese Government is gratified at the thought that it has co-operated with the League for 13 years as one of the original members and as a member of the Council, recognizing that the mission of the League is promotion of peace and order, which coincides with the desire of Japan to establish peace in the Orient as its contribution to world peace.

"It is an indisputable fact that Japan has participated in the work of the League with an enthusiasm which is second to no other country. During its membership, the Japanese Government has realized that it is necessary to apply the Covenant on the basis of actual facts of conditions in member states in the maintenance of peace, taking into consideration the present tendency in international relations. It has been confident also that by this just policy alone can the League hope to accomplish its mission and increase its influence.

"Since the Sino-Japanese dispute was taken up by the League in September 1931, the Japanese Government, animated by these convictions, maintained at all meetings of the League and on other occasions the necessity of discussing the problem on the basis of reality, with proper appreciation of facts concerning the situation prevailing in China. The Japanese Government has pointed out in particular that China is not an organized nation as its internal conditions and international relations are extremely complicated. Under such circumstances, the Japanese Government has insisted on the absolute necessity of taking into consideration the fact that various fundamental principles of international law and precedents must be considerably modified when applied to China.

"But, as the result of discussion of the problem by the League during the past 17 months, it has become apparent that there is considerable discrepancy between the views of Japan and the other members of the League regarding application of the Covenant, various other treaties and fundamental principles of international law and their interpretation, due either to failure on the part of many states to grasp the facts of the case or to refusal to face the facts.

"In consequence, the report adopted by the League Assembly held on February 24 contains many errors of fact and logic, failing to appreciate the position of Japan, which seeks to contribute to the maintenance of peace in the Orient. It may be pointed out in particular that the report brands the action of the Japanese army on September 18, 1931 and thereafter as not legitimate self-defense. It also overlooks the fact that responsibility for strained relations between Japan and China in Manchuria before the outbreak and aggravation of the situation since rests with China.

"As a result, there was further complication of the political situation in the Orient on one hand and on the other the establishment of Manchukuo as an independent state, which has been ignored by the League. At the same time, the Assembly report refuses to recognize the position of Japan, which has recognized Manchukuo, thus destroying the foundation on which stability in the Orient might be laid. Various conditions in the recommendations to the Assembly do not contribute to the establishment of peace in the Far East, as stated in the document issued by the Japanese Government on February 25.

"It is apparent that in the disposal of the Sino-Japanese dispute, members of the League hold that support of inapplicable formula is more important than securing actual peace. It is also apparent that member states regard hypothetical theory more important than removal of causes for dispute in the future. There is also considerable difference in the interpretation of the Covenant and other treaty engagements as made by Japan and the member states, as stated in a former paragraph.

"The Japanese Government is convinced that there is a fundamental difference in attitude between the League and Japan regarding establishment of peace in the Orient. It is for this reason that the Japanese Government has come to the conclusion that it can no longer co-operate with the League and hereby notifies the League of Japan's withdrawal, according to the provisions of Paragraph 3 of Article 1 of the Covenant."

none of these dependencies has China any longer any control. Tibet is independent; Chinese Turkestan is completely cut off from contact with China Proper. Only Manchuria has remained down to last year a part of China—a part by measure of contact and association under the nominal sovereignty of that country. To say that Manchuria was under the full sovereignty of China would be a distortion of the actual and historic facts. Now this territory has gone; it has become an independent state.

Disorganization Cited

"China is a vast country; but it is not a nation or country in the sense that Western peoples use the term. It is a country, as I have said, larger than Europe, a region with as many governments in it as there are governments in Europe, a region with almost as many different groups of peoples, speaking almost as many mutually unintelligible dialects. That is one reason why China, in spite of her size, in spite of the enormous number of men in various armies of the many dictators, is unable to defend itself to-day, unable to rid itself, as it desires, of the foreign military forces stationed in and about its treaty ports and the foreign naval vessels that ply the Yangtze River.

"These forces, as I have also said before, are not only Japanese. They are British, American, French, Italian and others. They guard the lives of their diplomats accredited to the Central Government. Less than five years ago a portion of these forces, British and American, had to go into action at Nanking, the capital of the country, to save the lives of their official representatives assaulted by Government troops.

"For the moment, however—this present moment—the hostility to other foreigners is abated; it is being officially restrained with a definite object in view. We are not now hearing of China's determination to undo the unequal treaties. Why not? Why has this agitation, vigorously and officially conducted prior to September, 1931, come abruptly to an end? The answer is obvious. I need not make it. China is a backward country, a country in an appalling condition of disintegration and distress. China is a problem, as the Lytton Commission has reported, to the peace of the world.

"Beside China and beside another vast country—I speak of Soviet Russia—is Japan, a comparatively small country very different from either of its colossal neighbors. The conditions of these neighbors in the past 20 years have given us Japanese deep and anxious concern. Our anxiety is not ended. We look into the gloom of the future and can see no certain gleam of light before us.

"Inexorably situated beside China in chaos, Japan has had to bear and forebear, and for many years tried patiently to have her many grievances with the Chinese settled in an amicable manner. She has followed that policy of conciliation even in the face of violent criticism from a portion of her own people. It has been Japan's hope and determination that Manchuria should become a land of law and order, of peace and abundance, a land that would be of benefit not only to Eastern Asia but to the world at large. To achieve that end, Japan was long prepared to co-operate with China, and she sought this co-operation—sought it for years.

"The Chinese, however, would not accept our proffers of friendship and assistance. Instead they offered constant obstructions and created continuous difficulties. In recent years, and especially since the deliberate development of anti-foreign sentiment by the Kuomintang and by the Nationalist Government, this opposition was intensified. The more we displayed patience, the more intense became the opposition, until at last it reached a point that was intolerable. Instead of meeting us half way, China took this attitude of ours as a sign of weakness. The Chinese began to claim that the Japanese should be driven out of Manchuria, that Japan should no longer share in the development of that land, condemning Japan as aggressor, pure and simple, as if there were no reason whatever for her to be in Manchuria, ignoring the historic background. The impossible attitude and violent movement based on such psychology on the part of the Chinese lay really at the bottom of the trouble that finally resulted in what happened. Japan's policy of patience and conciliation failed. It failed because of China's, or rather Marshal Chang Hsueh-liang's inability to appreciate Japan's intentions and friendliness.

Two Wars in Manchuria

"It should not be necessary for me to dwell upon the importance that Japan attaches to Manchuria. The Assembly of the League should know by this time the economic and political necessities of Japan in that territory. But at this critical moment, I want to remind you again that Japan fought two wars in Manchuria, in one of which she staked her existence as a nation on the outcome. She wants to fight no other. It is true that international peace can be secured only upon the basis of mutual concessions.

"There are, however, with every nation, certain questions so vital to their existence that no concession or compromise is possible. The Manchurian problem is one of them. It constitutes such a problem to the nation of Japan. It is regarded by our people as a question of life and death.

"The Powers of the world have long been dealing in fictions regarding China. Long ago, we should have noticed that the first article of the Covenant requires that a State, dominion or colony, to be a member of the League, shall be 'fully self-governing.' China is no such State. Beyond China Proper the sovereignty of China has long been gone, while within China Proper there has been no constituted government supreme and able to govern. The Nanking Government administers to-day the affairs of less than four of the 18 provinces. The world cannot deal in such fictions as these and call upon the League to uphold the letter of the treaties.

"It is the firm conviction of the Japanese Government that Japan has been and will always be the mainstay of peace, order and progress in the Far East. If she has taken a definite stand regarding Manchuria in recent months, it is because she has been actuated by implicit faith that was the only course left to her after years of unrewarded forebearance and waiting. If she insists upon the maintenance of the independence of Manchukuo, she is guided by a confident belief that in the present circumstances that independence offers the only guarantee of peace and order in the Far East.

China and League Blamed

"Even after the present Sino-Japanese dispute began, Japan continued in her policy of conciliation. If China had been capable in those days of realizing the actualities of the situation and had agreed to negotiations with Japan in sincere desire to arrive at an agreement, one could have been accomplished without great difficulty. But China did not take that course. Instead, she appealed to the League of Nations. She sought to bind Japan's hands through the intervention of the Powers composing the League. And the League, not fully understanding the real issues involved or the actual conditions existing in the Far East, and perhaps not suspecting her real motive, gave encouragement to China.

"It cannot be doubted that the League of Nations, in dealing with the Sino-Japanese dispute, endeavored sincerely and conscientiously to bring about a satisfactory settlement at an early date. But in point of fact, its actions have continually resulted in giving to China false hope and in encouraging her to take an attitude of defiance against Japan. In making her appeal to the League, China was not, as you have been told, acting from her love of peace and her loyalty to the League's principles. A country with more armed men than any other in not a nation of pacifists. A country which has habitually broken international pledges is not a nation that respects principles.

"In proposing to the League to send a commission of inquiry to China, Japan was actuated by the belief that it was urgent and essential that the League should fully understand the realities of the conditions existing there. But the result was disappointing to Japan. The report of the commission proved to be, in some respects, superficial in character. It displayed in parts a lack of penetration. It often failed to probe the problem to its depths. One of the reasons for this was undoubtedly the brief time in which the commission had to make its investigation.

"In this connection let me say a word regarding the population of Manchukuo. A false impression has been given to the world by the Lytton report on this subject. There were no authentic statistics upon which the commission could base its views. No reliable Chinese census has ever been taken, even of China Proper, and any figures placed before the Commission by the Chinese authorities could not be regarded as dependable. For many years, the racial term Chinese has been applied, particularly by foreigners, including the Japanese, to most of the people of the Chinese Empire. But this laxity in precise expression should not be taken to mean that the Manchus and Mongols, or even the people of China Proper, are all of the single racial stock.

People are Different

"The majority of the people of Manchukuo are distinctly different from those of China. Even the people of North China, from the Provinces of Shantung and Hopei, who have immigrated to Manchuria to the extent of several millions in recent years, are strikingly different from those of the other Chinese provinces, different from those of the Yangtze Valley, more different from those of South China, racially different from those of Western China, different in physical appearance, different in many of their customs and in some cases even in their language. But even these immigrants who have gone from China to Manchuria in recent years do not form the bulk of the population. They form probably but a tenth, and at the most, but a fifth of it. The great body of the population can be properly described as Manchurians. It is formed by the descendants of old Manchu stock, by old Chinese stock which affiliated itself with Manchus in former years, and by the Mongols. The great majority of these people have never lived in China and have no such attachment to that country as the Lytton report describes. Here the report was clearly in error.

"Regarding the report of the Committee of 19, I am constrained to make a critical remark. I do not want to accuse that committee of prejudice. But I can not refrain from making observation that, while China is exonerated, nothing whatever is said of the work of my country and people in their long and difficult efforts to preserve peace, to promote law and order, to benefit the people of Manchuria. The good work of my country in Manchuria is on record. It is not on record in the draft report, but it is there ; it can be seen in Manchukuo. The physical developments that we have made in Manchuria are the visible monuments to our efforts and ability. The well ordered cities of the Leased Territory, the thriving condition of the railway zone, the improvement of the Chinese cities influenced by our initiative, vast mining and industrial enterprises, schools, hospitals, technical bureau : these things, the like of which exist nowhere under the Chinese administration, are testimony to our work.

A Civilizing Force

"In short we have been and are a great civilizing and stabilizing force in that wild country. If the Committee of 19 knew and understood what we have done to benefit the people of Manchuria, they might have gone out of their way to say a word in favor of this work. If they did not know and understand why the people of China Proper migrate to Manchuria, it might have been well for them to enquire. Yet they have felt that their knowledge was sufficient to qualify them to propose to the Assembly that it adopt the momentous proposal contained in the draft report.

"On the first page of the report are these lines. I will quote them : 'The issues involved in this conflict are not as simple as they are often represented to be. They are, on the contrary, exceedingly complicated, and only an intimate knowledge of all the facts, as well as of their historical background, should entitle any one to express a definite opinion upon them.'

"Beginning with this statement, the Committee of 19 has proceeded to pass judgment against the nation which is the bulwark of whatever law, order and peace exists in the Far East, and in favor of one whose backward condition has been the cause of wars for nearly a century. I suppose I may take it that the members of the Assembly who are now about to vote on the draft report have all read histories of China written by impartial authors. But I am not too sure of that, for there seems to have been a lack of careful reading, even of the Lytton report.

Quotes Lytton Report

"Let us now turn to the recommendations made by the Commission of Inquiry. Their full significance seems to have been overlooked in the draft report before us. I will refer in particular to the tenth and final principle in Chapter 5. That principle reads as follows :

"'Since the present political instability in China is an obstacle to friendship with Japan and an anxiety to the rest of the world, as the maintenance of peace in the Far East is a matter of international concern ; and since the conditions enumerated above cannot be fulfilled without a strong central government in China, the final requisite for a satisfactory solution is temporary international co-operation in the internal reconstruction of China, as suggested by the late Dr. Sun Yat-sen :—

"'In China, as thoughful men have come to recognize that the vital problem, the real national problem, for their country is the reconstruction and modernization of the State, they cannot fail to realize that this policy of reconstruction and modernization, already initiated with so much promise of success, necessitates for its fulfilment the cultivation of friendly relations with all countries, and above all that great nation which is their nearest neighbor. China needs, in political and economic matters, the co-operation of all the leading Powers, but especially valuable to her would be the friendly attitude of the Japanese Government and the economic co-operation of Japan in Manchuria. All the other claims of her newly awakened nationalism—legitimate and urgent though they may be—should be subordinated to this one dominating need for the effective internal reconstruction of the State.'

"I would ask the League to consider carefully this definite warning. I would ask that it be not misled by the thought or hope that China can be changed by the mere sending of technical commissions to aid the harassed government with advice regarding sanitation, education, railway, financial and other administrations. More than that is needed, much more : so much that no great Power or group of them would be willing to undertake the task. Some form of peaceful international control will be necessary. Of this I am speaking earnestly with the knowledge of China, the real China, that exists in fact and not in history or imagination ; the China that has made many wars already and now seeks to make another ; the China that does not fight her own battles but calls on distant friends to fight her nearby neighbor.

Questions China

"In the above connection, permit me to put one categorical question to my Chinese colleagues. 'Is the Chinese Government prepared to accept these recommendations which envisage, in a final analysis, the imposition on China of international control in one form or another ? Will you make the position of your Government clear on this point before the Assembly votes on this present draft reports ?'

"I have no doubt that the attitude of the League in the present dispute has always been conceived with a genuine desire to uphold the sanctity of the treaties and the principles of peace, and to serve the cause of peace, but its efforts have had the result of adding confusion to the situation. The Jehol affair, which is giving all of us concern at the moment, is a case in point. It is a demonstration on China's part, made for the purpose of affecting the League's decisions. There would have been no onrush of Marshal Chang Hsueh-liang's troops beyond the Great Wall except for instigation from the Nanking Government, which in turn has been encouraged by the attitude the League of Nations has been taking vis-à-vis Japan.

"The Japanese Government is not in the least anxious about the outcome of the conflict with these Chinese contingents. They are not troops of a modern army, well trained, well disciplined, well organized, well officered. They are not troops inspired with zeal for the cause or love of their country. They are mercenary troops, with loyalty only to their military chiefs, and like other Chinese armies are loyal because their chief provides for them the means of living. But Japan is loath to see further unnecessary bloodshed, and for that reason is endeavoring to persuade Marshal Chang to withdraw his forces. Prospects, however, do not seem at this moment very encouraging.

Effect of Report

"I refer to the situation in Jehol to bring home to you the possible effect the adoption of the report now before us may have upon the situation in the Far East. Adoption of this report would give the impression to the Chinese that they had been exonerated of all responsibility, that they could continue to defy Japan with impunity. It would serve further to embitter the feelings of the Japanese and Chinese people, whose interests are closely interwoven. The two peoples ought to be friends and should co-operate

with each other for their common welfare. By the adoption of the report before you, the Assembly would not be helping us, either the Japanese or the Chinese, along the road to that goal, nor would it serve the cause of peace or the interests of the suffering masses in China.

" The report of the Committee of 19 not only accepts the report of the Commission of Inquiry, but goes even farther ; it passes judgment on the basis of premises which are incongruous and far removed from the actualities. Chinese sovereignty in Manchuria was only nominal at the most, but the draft report before us would undertake to establish Chinese sovereignty over Manchuria in a more or less effective manner ; that is to say, it undertakes to introduce into Manchuria power and influence that China has never had before. Let us pause and think : Does it stand to reason ? It would, moreover, open the way for the Chinese agitators and give rise to more complications only to end in another, and possibly worse catastrophe.

" Again, the draft report makes an attempt to establish a measure of international control over Manchuria, where there has been and is no such control. What justification is there for such an attempt ? I cannot see. Would the American people agree to such control over the Panama Canal zone ? Would the British people permit it over Egypt ? In any case, how would you do it ? Which of your governments would undertake it, assuming a grave and heavy responsibility certain to entail sacrifices ? In this connection let me state it clearly, once and for all, that the Japanese people will, for reasons too patent for me to feel it necessary to explain, oppose any such attempt in Manchuria.

Boycott Question

" A verdict is given in the draft report that the Chinese boycott against Japanese goods imposed after the outbreak of the present dispute falls within the purview of retaliatory measures. If adoption by the Powers of any forcible measures, made necessary by the exigencies of the situation, for the protection of their rights and interests, is on each occasion to be met lawfully by retaliatory boycott, a dangerous principle will have been established. Seeds of incalculable future trouble for each and every Power interested in China will have been sown.

" In the circumstances which Japan finds herself in, as above described, and for the reasons above stated at some length, there is no alternative for Japan to take in regard to the draft report before us. The League has left her none. She has promptly and unequivocally to answer, ' No.'

" Gentlemen, our desire is to help China as far as lies within our power. This is the duty we must assume. Paradoxical as this statement may sound to you at this moment, it is true, and our present effort to assist Manchukuo to her feet, over which we are unfortunately having differences, will lead some day, I am confident, to the realization of Japan's desire and duty to help China and thereby at last to succeed in firmly establishing peace throughout the region of Eastern Asia.

" I beg this body to realize the facts and see the vision of the future. I earnestly beg you to deal with us on our terms and give us your confidence. To deny us this appeal will be a mistake. I ask you not to adopt this report."

Realities in the Far East

(The following is an address delivered recently in New York before the League of Nations Association)

By HERBERT S. HOUSTON

It is difficult to make a speech about peace when guns are sounding around the Great Wall of China. The American papers carry the news that the Japanese troops are again advancing in Jehol : so while we discuss the machinery of peace the machinery of war is making decisions. France completes her fortifications on her borders, and Hitler rises to power in Germany. Peru and Colombia quarrel over a little frontier town on the Upper Amazon, while the soldiers of Bolivia and Paraguay are fighting in the Chaco. At such a time, I submit, the friends of peace the world over must arm and fight the good fight for peace. But they must do it as idealists who at the same time are grim realists. My plea to-day is that we squarely face realities.

Everyone here sincerely desires two things—the preservation of peace and the preservation of the peace machinery. And I am confident that no one desires that more sincerely than do our friends from China and Japan. But how can both things be done ? Many of us have despaired of either being possible. Now I have the adventuresome spirit to believe that both things are possible if the League and its friends throughout the world have the courage to face realities. And the first reality to face is that the League has thus far failed to find a sound basis for peace between Japan and China.

Let us take a quick look at China, not through the Lytton report or through Japanese eyes but through the sober statements of responsible Chinese themselves. A year ago last summer I had an interesting interview in Shanghai with T. V. Soong, the ablest man, probably, in the Nanking government. When I remarked that everyone in my country hoped that the Chinese Republic would succeed he replied : " I know that that is the way America feels, and we would succeed if we could have five years of internal peace." And then he added these portentous words : " Of all the money I can raise, as Finance Minister, from all sources, eighty-five per cent goes for internal war." That, bear in mind, was a few weeks before the trouble broke out in Manchuria. You see, therefore, that when China appealed to the League for peace she was spending for war, within her own borders, eighty-five cents out of every dollar her Finance Minister could raise.

Is it any wonder that over three hundred unfinished cases, brought by Japan against China, were pending in September a year ago when the bombs were exploded on the railway near Mukden ? China has been simply unable to function as a responsible government that could fulfill its international obligations or even protect its own people.

This was nothing new. Our own country understood it and acted on the knowledge, just as it is doing to-day. I was vividly reminded of this when I saw in the Yangtze at Nanking two American gunboats. They were patroling the great river to protect American lives and American property, and I recalled that, as recently as in 1927, during the attacks on Americans and other foreigners, our gunboats had shelled that very capital of the Chinese Republic —and this in spite of the Kellogg Pact, the Nine-Power Treaty, or the established comity of nations. It seemed to me then, and it seems to me now, that we should be fair enough to admit that we ourselves acted in Nanking on the very same principle that Japan has acted upon in Manchuria.

A Make-Believe

But what has this to do with the failure of the League ? Just this : every nation represented at Geneva knew that in its own dealings with China it did not consider China a responsible nation. To act collectively, therefore, as if China were a responsible nation, was and is a hollow mockery, a game of make-believe, an excursion with Alice behind the looking-glass. As that great student of the Far East, J. O. P. Bland, says in his new book, " China, the Pity of It." And " the pity of it" is what one must truly say of this solemn show at Geneva, this long-drawn-out effort to make illusion look like reality. It simply can't be done.

Now let us take another look at reality. Shanghai, the greatest and richest city in China, you would naturally expect to be under Chinese control. But quite the contrary is the fact. Shanghai, or its business heart that is the dynamic center of China, is completely under the control of the nations that are represented in the League, with the United States added. Indeed, the Chairman of the Control Committee is Sterling Fessenden, a staunch American from Maine. So behold again the edifying paradox of nations that will not permit China to govern even her greatest city sitting in judgment between Japan and China in Geneva. This would be high comedy if it were not such utter tragedy—the tragedy of defeating the hope of peace and of seriously injuring the machinery of peace.

The outcome is bound to be a stalemate, whatever final form it takes. It is the inevitable result when reality squarely strikes illusion. If reality had ruled at Geneva, as the nations follow it themselves in China, China would not be a member of the League but would be aided and guided, as Shanghai is, under some form of international co-operation. This has been urged by far wiser people than I am, but I have strongly advocated it ever since I saw what the nations were doing co-operatively in Shanghai. Surely if this constructive result can be achieved in China's greatest city, over a period of years, it can be achieved in China itself.

Let me call your attention especially, in this connection, to the tenth and concluding recommendation in the Lytton Report. It is in these timely and significant words: "Since the present political instability in China is an obstacle to friendship with Japan and an anxiety to the rest of the world, and since the conditions enumerated cannot be fulfilled without a strong Central Government in China, the final requisite for a satisfactory solution is temporary international co-operation in the internal reconstruction of China, as suggested by the late Dr. Sun Yat Sen."

Unfortunately, this recommendation—which, it seems to me, offers the one realistic basis for settlement, within the League and by the League—has had virtually no consideration at Geneva. Had that been given, the whole situation might have been far different from the one that faces the League to-day. It might have been possible to reassure Japan that her vital interests would be protected in Manchuria, through international co-operation, and thus to have effected a change in her attitude. Instead the issues have been joined on the basis of unreality and we are witnessing the inevitable result.

As to Manchukuo, the reality is that this new state seems clearly to be on the way of progress. The reports given out by the Japanese Consul General, Mr. Horinouchi, a week ago, and the series of articles recently appearing in the *Herald Tribune*, from its correspondent Mr. Victor Keen, agree that a really remarkable advance is under way. The budget is balanced, the currency is stabilized, the bandits are being overcome, new railways and factories are being built, along with many schools, and the whole record reads like the epic of Japan's own progress in the past sixty years. It is easy to believe that the Chinese, south of the Great Wall will continue to pour into Manchuria, at the rate of a million a year, just as they have been doing ever since Japan established a fair degree of law and order. What will be the ultimate result no one can foresee. It may be that in the future, soon or late, Manchukuo may lead the way toward a great federation. But if that should come, it would seem reasonable to believe that it will be due largely to the organizing and administrative genius of the Japanese.

A Touch of Reality

One thing, at least, may be considered certain—the indestructible Chinese people will go forward, as they have been doing for thousands of years, tilling their Good Earth and living their lives after their immemorial customs. This country can never be sufficiently grateful to Pearl Buck or do her too much honor for her service, through her books, in revealing to us the Chinese people as they are. Here again is a touch of reality that pierces the illusions we have cherished so long—cherished them to the great harm of China. With the air cleared we can at last see things as they are and give expression to our deep friendship for China along lines that will be to her lasting benefit.

Yesterday I heard the distinguished Ambassador of Japan, Mr. Debuchi, make a singularly enlightening address before the Chamber of Commerce of the State of New York. When he was introduced, the President of the Chamber read the resolution the Chamber had passed in 1855, thanking Commodore Perry for his courageous initiative in negotiating the first trade treaty with Japan. The Ambassador, in his address, followed the growth of trade and friendship between the two countries throughout the seventy-eight years since the treaty was made. He referred to times of strain that had come in the relations between Japan and America, only to be succeeded by a firmer friendship, and he predicted that that would be the case, following this country's present misunderstanding of Japan's vital interests in Manchuria. His characterization of those interests, it seemed to me, was clear and fair, in the light of history. Japan had sacrificed a hundred thousand men and a billion dollars in treasure in checking the Russian encroachment on Manchuria, which was a direct menace to Japan, and since the treaty of Portsmouth had invested another billion in developing the country. As he graphically put it, "historically, economically, and geographically Japan's special position in Manchuria cannot be disputed."

The one thing that many people in this country would dispute is the rigor with which Japan has sought to enforce her special position. On this point there are evidences that sober-minded people in Japan have likewise had a good deal of serious questioning. But in all countries an army is the embodiment of force and, as we learned ourselves in the great war, public opinion rushes to support it. That is surely true in Japan and if peace is to be assured in Asia the constitutional forces of Japan must be allowed to gain and hold control. Manifestly, that requires from this and other countries that realities be squarely faced.

Progress of Manchukuo

But while repercussions and reactions of various kinds and degrees are apparent in different countries, Manchukuo is on the march of progress. That appears to be clear and is conceded. What the League may do or not do will affect this progress but little. The League will simply have to emerge from unreality to reality and the friends of the League will hope that the damage to its machinery will not be beyond repair. My own belief is that that will be the case. All members of the League are in the same boat, including Japan. They have shipped a lot of water on this cruise with an imaginary China and they should bail out the water and start over again. This simply shows that the League is human and, being human, it should learn from experience that this old world, although it should be guided by the stars, is, after all, a world of reality. As I heard that wisest of our elder Statesmen, Elihu Root, say a year or two ago: "The most essential element in sound international relations is time—and still more time." I wonder if that will not prove to be especially true in finding the way to peace between Japan and China.

What has really been happening at Geneva has been a gradual unfolding of an attempt to do the impossible. As Paderewski said on arriving from Europe the other day, "the League has attempted to do something beyond its power." This doesn't demonstrate the failure of the League as much as it does its limitations. The League continues to be an essential agency of international co-operation to maintain peace. But it must always seek peace on the soundest and fairest basis on which it can be established. The *Herald Tribune*, in a recent editorial, put the whole Geneva situation in this penetrating question and answer: "Under the existing constitution of the League could any group of responsible statesmen have done more? And the editorial replied to its own question in this sane and realistic way: "As responsible statesmen it is their concern to keep the peace of the world rather than to uphold the infallibility of the world's peace machinery." In my judgment, that is the sound view for convinced and strong supporters of the League to take.

America's Role

May I now make a few observations on the part that America has been playing. And I speak as one whose family has been in every war from the revolution to the present. The net result of that inheritance is the burning conviction that war is brutal and barbarous and, in nearly all cases, futile. I believe that that is the deep sentiment of this country. When Count Kabayama was here a year ago he made this penetrating statement: "America doesn't hate Japan but America hates war." And that is true. But unfortunately a chain of events has made it appear that we

hate Japan. Consider for a moment some of the links in this chain. When the League covenant was framed Japan was eager to have it contain an article recognizing racial equality. Through America's opposition this article was omitted. Then we passed the immigration law excluding the Japanese from the quota, although it affected less than two hundred Japanese a year—an utterly gratuitous affront to a proud and friendly nation. When the Manchurian difficulty arose we suddenly appeared at Geneva as a temporary member of the League, participating in formulating decisions although accepting no obligations or responsibilities. A little later, January seventh a year ago, Secretary Stimson, without notice or discussion, declared his new doctrine, aimed directly at Japan. Again in January of this year, on the eve of the meeting of the League's committee of nineteen, he restated his doctrine and did it in such a way to clearly imply the support of President-elect Roosevelt.

The latter, when appealed to for confirmation, sat down in his library and wrote out with his own hand the simple but tactful statement that international relations had to rest on the sanctity of treaties. Naturally, the President-elect, with the important war debt discussions impending, declined to be put in the embarrassing position of either affirming or denying the Stimson doctrine. President Lowell of Harvard, in an address before the Foreign Policy Association in Boston squarely challenged the new doctrine and, after a full discussion, his position was strongly supported by the thousand people present. A few days ago one of the most influential Democrats in the nation said to me that he considered the Stimson doctrine "extremely dangerous" and he commended Governor Roosevelt for his wise comment on the sanctity of treaties.

Final Link in China

The final link in this chain of unfortunate events has been the assembling of our entire fleet in the Pacific. Only a day or two ago you read that the greatest war manoeuver our navy has ever engaged in would go forward—of course with a vast amount of accompanying publicity both in Japan and this country—around our great naval base in Honolulu. Surely this is not the road to peace. Although I realize that it is not so intended I submit that, at this particular moment, it is unwise and provocative. If you would get a close-up on the present sentiment of Japan I would urge that you read William G. Shepherd's remarkable interview with Lord Lytton in *Collier's Weekly* of January 14. Here under the startling but true caption "Japan Wrapped in Dynamite" is an outline of Japanese conditions that I wish Lord Lytton might have made the conclusion of his report to the League of Nations.

Let us not delude ourselves into thinking that we are without responsibility because things are as they are. The plain truth is that quite the opposite is the fact. We have not joined either the League or the World Court. On the contrary, we are in danger of finding ourselves, unless we search our souls and accept our responsibilities, in the position of a nation that unconsciously promotes war while consciously and continuously professing peace. For one, I confess to the strong hope that the new president, trained in the doctrine of Woodrow Wilson and tempered in the realistic school of experience, will prove to be a wise pilot who will guide this country in doing its full part in charting the international seas.

In closing I would turn from an incoming president for whom we have high hopes to a great wartime president for whom we have imperishable memories, Abraham Lincoln. Why does a courageous idealist like William Lloyd Garrison fade into the past, nearly forgotten, while Lincoln grows year by year into greater stature? It is because Lincoln was both a courageous idealist and an unflinching realist. When the abolitionists clamored for immediate emancipation he calmly replied: "First let us save the Union." When timid souls urged that the South be allowed to go its way in peace he sternly replied: "Our job is to save the Union." So to-day we must be both idealists and realists and the League of Nations can be saved.

Russia in the Metal World

THE First Five Year Plan for the industrializing of Russia has been declared closed by the Soviet Government at the end of four years.

Although a considerable proportion of the elaborate program for the five years period remains uncompleted, the results obtained have been remarkable on the whole, although in some important directions the achievements have fallen much below the estimated progress. Among the industries which lag far behind the original program appears to be the metal-producing industry. But even in this industry very appreciable progress has occurred. According to German Press reports, the Russian steel production in 1932, although much below the program quantity, was the highest of any country in Europe. It was the only steel industry in Europe which showed an increased production in 1932; at the same time, its position at the head of European steel-producing industries is due less to its own progress than to the fact that steel production in other countries was abnormally low everywhere else last year.

Nevertheless, reports in the Russian Press refer from time to time to very disappointing results in both the coal mining and the iron and steel industries, notwithstanding the very large sums spent in improvements and new plants to increase their efficiency. The *Pravada*, too, reported some time since that the production of primary copper during the four years of the "Five Year Plan" was practically stationary and that the moderate amount of increased production was due to increase in secondary copper from scrap. The comparative failure of these industries to respond to the efforts made naturally was reflected in lower production in other industries dependent on coal and copper, and especially the electrical construction industry. Obviously the task of co-ordinating interdependent industries so that each receives its due proportion of material is well nigh an impossible one under the Soviet system; it is quite other than obtaining supplies in world markets in the necessary quantities as and when required.

The success obtained by the Soviet rulers in the industrialization of Russia has been obtained only at the expense of the standard of living of the Russian population. This population, buoyed up by visions of an Utopian character when the industrialization plans are completed, have apparently submitted more or less passively to the severe privations required of them, and there is no evidence so far of any serious revolt against the hard conditions imposed.

The Soviet Government has now commenced the attempt to carry through a second Five Year Plan with a program, which on paper would make Russia in certain directions the largest industrial country of Europe, with the advantage of possessing practically every kind of raw material needed for her industries in the vast territory comprising the U.S.S.R. Whether or not it will be possible to keep the population docile under another five years of privation like the last four years, is a question on which it is difficult for British minds to form an opinion. What seems more certain is, that the further five year period will be entirely too short to complete the program laid down, so that at the end of the period it will still be necessary to demand from the Russian people further sacrifices which may well prove to be the breaking point of their endurance.

Assuming, however, that the larger part of the metal-producing part of the program is carried out—a large assumption—it is fairly obvious that by that time, the Russian requirements in metals will be fully covered; indeed, it would seem that a complete realization of the metal-producing plan might leave a surplus for export. At the present time Russia is a fairly important customer of metal producers outside. It took from Germany, for example, 31 per cent of the total exports of German steel last year; it bought considerable quantities of aluminium, chiefly from Germany and Canada, as well as nickel, lead, zinc and tin from different countries.

**The Mining Journal.*

With regard to the steel imported by Russia, this could have been produced in Russia if the program for production had been realized, except perhaps certain "quality" steels in the manufacture of which the Russian industry has not yet been very successful. The production plans in regard to aluminium are on an equally ambitious scale and production was started last year in a plant with a capacity to cover recent consumption of aluminium in Russia. The production of aluminium, however, is a highly technical affair, and it would not be surprising to learn of early troubles in these Russian attempts at production. The Russian bauxite used for the production of aluminium is not of high grade, and various schemes for preparing it for reduction, of a novel character, have yet to be fully proved. The production of copper, lead and zinc in large quantities is merely a question of developing the industries on a basis of the sufficiently abundant ores of the same available in Russia and Siberia. Assuming the second Five Year Plan proceeds without internal or external interruption, it seems safe to conclude that at the end of that period, Russia will be in a position of independence as regards these metals. In some Continental circles connected with the metal markets, it is evidently believed that Russia will be a large exporter of non-ferrous metals in the not very distant future.

Against this view, besides the low efficiency referred to, there must be taken into consideration the very small present metal consumption per head of the population of Russia, and the potential enormous great increase; this applies not only to metals, but to petroleum, which is becoming one of the main exports of Russia. With any considerable economic improvement in Russia, and in the standard of living, a population of round 150 million souls could easily absorb the proposed increased production of metals.

In considering the Russian position, it is necessary to visualize an economic system which is unique in the world. The present necessity to export Russian products is mainly to balance the extensive imports of machinery and equipment in connexion with the industrialization plan. As this plan progresses, it must be assumed that such machinery and other material now imported, will be made in Russia itself in an ever-increasing degree, and that Russia is on the way to become gradually more and more self-contained. It is maintained by the Soviet that the increasing industrial capacity will then be employed in ministering to the wants of the Russian people and not, as many think, in glutting the world's markets at dumping prices.

With the present necessity to export, Russia suffers like all other exporting countries, from shrunken world markets and abnormally low prices. Figures from a German source show that last year, while Russian exports increased quantitatively, the value was much smaller than that of the smaller quantity of exports in 1931. The strenuous efforts of the Soviet authorities to widen their export trade by price cutting appear to have brought no increase in revenue from the exported products. In 1929 the Russian trade balance was favorable to the extent of 43.1 million roubles; in 1930, the balance was an adverse one to the extent of 22.4 million roubles, and in 1931 to the extent of 293.8 million roubles. The 1932 figures are not yet available, but it is understood that the conditions were similar to those in 1931.

Hitherto, the Soviet Government has apparently been able to meet all obligations for material supplied from abroad on long term credit, but with the growth of the adverse trade balance, some of Russia's creditors are said to be becoming nervous as to future payments. In any case, this position must tend to the restriction of credit, and the supply of materials to Russia on long term credits. This may well slow down, if not shatter, the program for the second Five Year Plan, including the large-scale metal producing plans.

One of the greatest hindrances to the industrialization of Russia and the development of the mining and metallurgical industries is the lack of technical direction and labor. Strenuous efforts are being made by the authorities to overcome this difficulty by establishing technical training institutes to train a personnel. As to the success being obtained in this direction, the reports are conflicting; on the one hand, it is maintained that the students eagerly and quickly assimilated the instruction given, but on the other hand, it is stated that lack of discipline and irregular attendance on the part of the students are characteristic of such institutes. Unless a fair amount of success is obtained in these training efforts, the chances for a realization of the industrialization plans must be very precarious.

Tanna Tunnel Nears Completion

Only 1,400 feet remain to be pierced in the Tanna tunnel construction. After many years of the most difficult engineering feats, the completion of the tunnel by this summer is now in the realm of possibility.

Every day, laborers are drilling into the rock many feet underground, moving forward two feet daily from the eastern portal and from five to six at the western. The infiltration of subsoil water has been controlled and victory is only a question of time.

The Railway authorities who have been carrying on the plan of shortening the Tokaido line, cutting out the Hakone Bend by means of the tunnel, are at last feeling at ease. Even with the most unexpected and difficult developments taken into consideration, the middle of August is the latest date set by them for the project's completion. If things move smoothly, the bore will be blasted through as early as the end of June.

One serious problem in connection with the construction of what will become the longest railway tunnel in Japan, has been the drying up of streams and wells in the region affected.

The underground waters, making their escape into the tunnel, have drained wells and ponds, causing great inconvenience to the farmers living in the land above the tunnel.

Since 1926, the Railway authorities have given from Y.20,000 to Y.40,000 in grants to the farmers, but in order to settle the problem once and for all, they have decided to expend Y.600,000 for relief measures.

In co-operation with the Shizuoka railway authorities, they have completed a plan for satisfying the protesting farmers.

The money will be spent in the following ways:

1. Transforming paddy fields into dry farms.
2. Bringing part of the water supply of the region by an aqueduct from the Karino River.
3. Building storage ponds in appropriate locations.
4. Supplying water by pumps where reservoirs cannot be constructed.
5. Using the water issuing from the drainage tunnel of the Tanna project for the irrigation of lower lands.

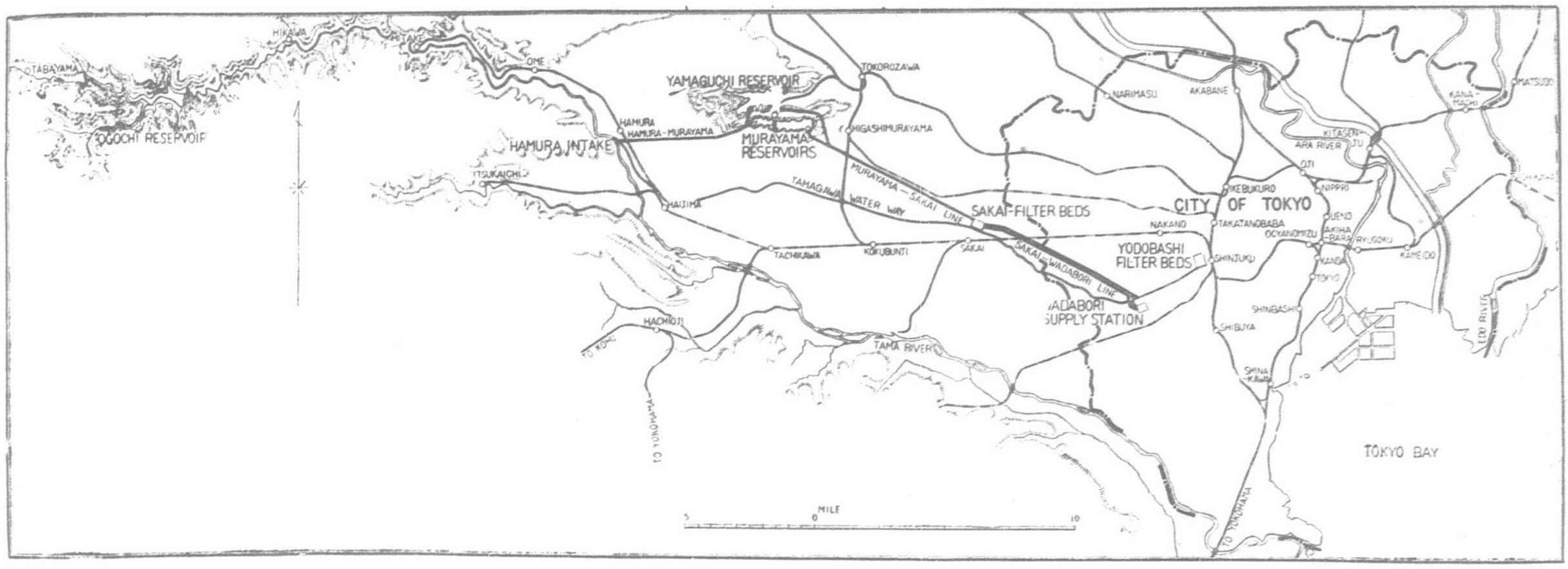
Attention has also be directed by the authorities to the rearrangement of the schedule of the Tokaido line, in view of the nearing completion of the tunnel. The question of the dwindling traffic on the Hakone Bend section of the present line is also taxing their brains.

New Canton Bridges

While the gigantic bridge across the Pearl River joining the Honam Island to Canton City proper is now in its final stages of building the Canton municipal authorities are stated to be contemplating the building of another bridge linking up the parts of the city, but crossing the river from the West Bund, in the vicinity of the wharf for the steamers of the Hongkong-Canton-Macao Steamboat Company, one of the most busy commercial centers of Canton city.

The Public Works Department is said to have received instructions for sounding the river bed on the proposed site for the new bridge, to see if the scheme is practicable. Large though the bridge now nearing completion is, it is felt that it alone is not adequate to meet the increasing volume of cross river traffic, more particularly when the construction of the inland port on the western part of Honam is completed. The proposed new bridge crosses the river at a point much nearer to the said inland port locality.

In this connection, it may be noted that another bridge is under consideration crossing the Pearl River further west of the city, and joining Canton to Fati. This bridge, which is to be built jointly by the Canton Municipality and the Canton-Hankow Railway Administration, has already passed its initial planning stage, and in fact a provisional contract has already been awarded to Messrs. McDonnell and Gorman, the same contractors who are building the bridge now almost finished.



Outline sketch of the Tokyo Water Supply Project

Tokyo's Water Supply Project

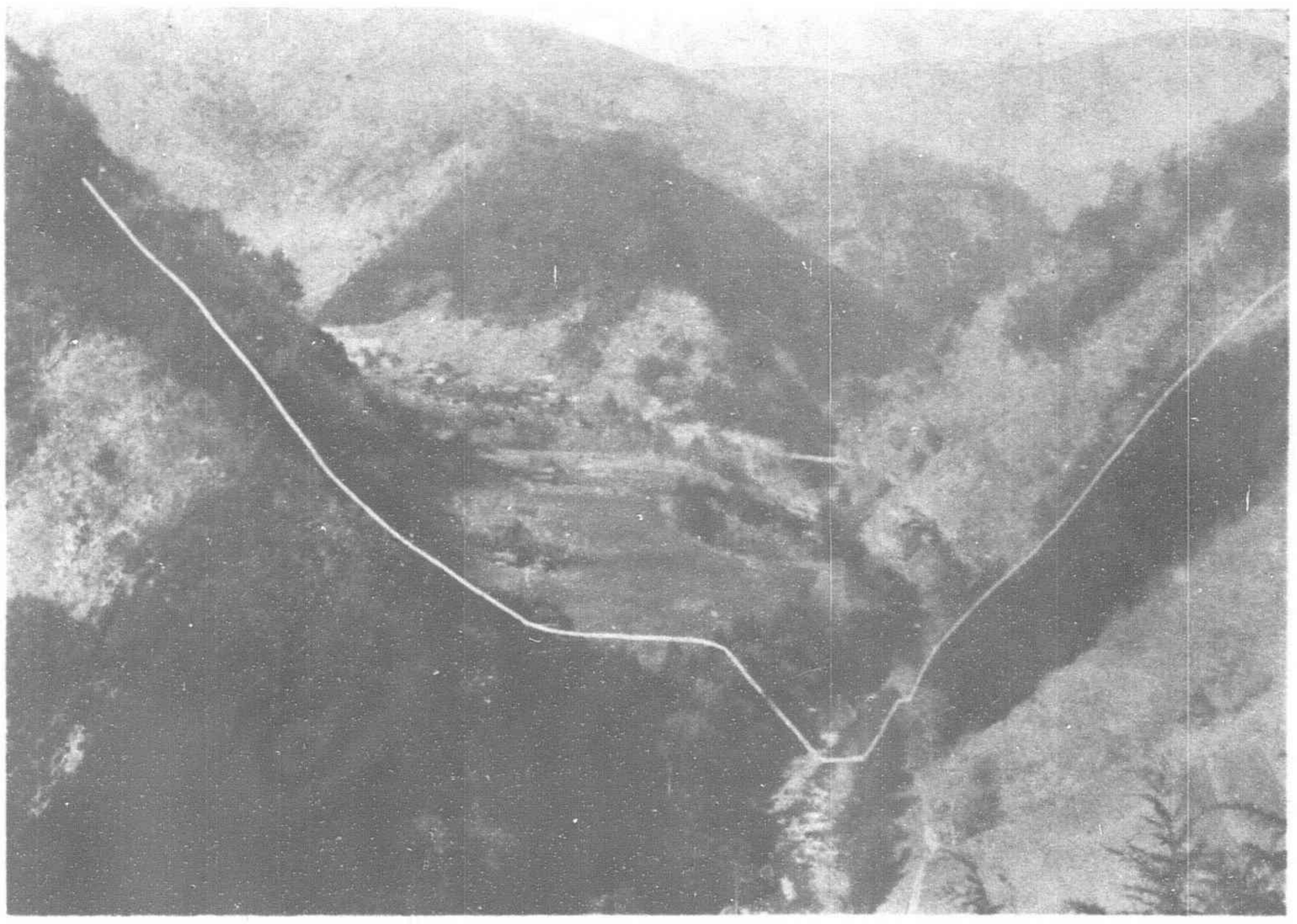
Construction of Ogochi Reservoir Dam, Second of Its Kind in World is Detail of Undertaking Covering Next Decade at Cost of Y.50,000,000

By W. HARVEY CLARKE, JR.

IN so far as mankind's experience and memory serve to testify, water, *aqua pura*—particularly clean, pure, fresh water—has ever been a primary requisite in the daily life of normal living creatures. As the last named and one of the important four cosmic elements of old,—air, earth, fire, and water—water is something that can never be dispensed with in its multitude of uses. An adequate supply of it, as a vital factor for continued existence, has always been ceaselessly sought by human beings who have gathered themselves into teeming metropolitan masses.

Thus foreseeing pressing demands to be made upon the water supply system of the municipality, since the city of Tokyo on October 1, 1932, absorbed 82 suburban towns and villages into its corporate fold, thereby adding 20 new wards to its 15 old ones, the Tokyo city waterworks bureau drafted further plans for extension to meet the impending responsibility that would be thrust upon it in supplying sufficient water for a population of nearly five and one-half million people dwelling within 213.4 square miles of territory embraced by the expanded city area. Owing to financial considerations, execution of these new plans will cover a period of a decade—that is to say, until the year 1943. The total estimated outlay for completion is set at close to Y.50,000,000, which includes a super-dam and gigantic impounding reservoir with six times the combined capacity of existing ones, 24 filter beds and four service reservoirs for Higashi-Murayama (East-Murayama), near Tokyo's present three impounding reservoirs, and necessary additional facilities for distributing water through the city.

The underlying scheme comprises construction of a concrete-gravity type super-dam and a reservoir capable of impounding approximately 6,600,000,000 cubic feet (244,444,444 cubic yards) of water in a valley surrounding the site of the village of Ogochi in Nishitama County, Tokyo Prefecture, on the upper reaches of the Tama River about 43.5 miles westward from the heart of Tokyo. This future dam, known as the Ogochi reservoir dam—work on which will shortly be under way—is to rise 440 feet from its foot-cutting. Moreover, it will be the second largest structure of its kind in the world. Having a height of about 700 feet, Hoover dam, now under construction near Las Vegas, Arizona, is the only one surpassing it.



Air view of Tokyo's New Ogochi Super Dam and Reservoir site 43.5 miles from Heart of Tokyo

The *Engineering News Record*, volume 105, No. 3, for July 17, 1930, gives a comparative list of the world's highest dams. This list is reproduced here, omitting those dams which are not more than 300 feet in height. It will be noted that Ogochi dam with its 440 foot height comes second, considering that construction

work on San Gabriel dam in Southern California has been suspended.

Largest Dams in the United States and Abroad

Tables prepared by P.I. Taylor, assistant engineer, Washington Office Bureau of Reclamation for the *New Reclamation Era*, give data on the highest and largest structures in this country and in foreign countries.

DAMS IN THE UNITED STATES

Name	*Location*	*Type*	*Height : Feet*	*Vol. : cu. Yds.*
Boulder* (Hoover)	Arizona-Nevada	Concrete gravity ..	700	—
San Gabriel†	California	Concrete arch gravity ..	500	3,800,000
Owyhee‡	Oregon	Concrete arch gravity ..	405	550,000
Diablo‡	Washington	Concrete arch ..	400	275,000
Pawima	California	Concrete arch ..	380	238,000
Pardee	California	Concrete arch gravity ..	357	615,000
Arrowrock	Idaho	Rubble concrete arch gravity	349	585,130
Oshaughnessy	California	Cyclopean masonry, arch gravity	344	390,223
Exchequer	California	Concrete arch gravity ..	330	440,000
Salt Springs‡	California	Rockfill, concrete face ..	330	3,000,000
Shoshone	Wyoming	Rubble concrete arch ..	328	78,576
Kensico	New York	Cyclopean masonry, gravity	307	900,000
Elephant Butte	New Mexico	Rubble concrete gravity	306	605,200
Horse Mesa	Arizona	Conc. variable radius arch	305	147,357

DAMS IN FOREIGN COUNTRIES

Name	*Location*	*Type*	*Height : Feet*	*Vol. : cu. Yds.*
Schraeh	Switzerland	Concrete, gravity ..	362	305,000
Camarassa	Spain	Concrete arch gravity ..	335	283,140
Talarn	Spain		330	

* Authorized for construction ; † Construction work suspended ;
‡ Under construction.

Before the incorporation of many outlying districts into the city of Tokyo, water had been supplied to the inhabitants of these communities by private water supply unions or private water supply companies. In some instances, village or town offices administered their respective water systems. After the incorporation of these regions into the city itself, the unions were transferred to the Tokyo waterworks bureau, while the private water supply companies are yet to be purchased by the city.

An appropriation of Y.29,900,000 was made last year for the purpose of expanding the water supply for the new area added to the city, and another appropriation of Y.50,000,000 for the former city was allotted for a similar purpose.

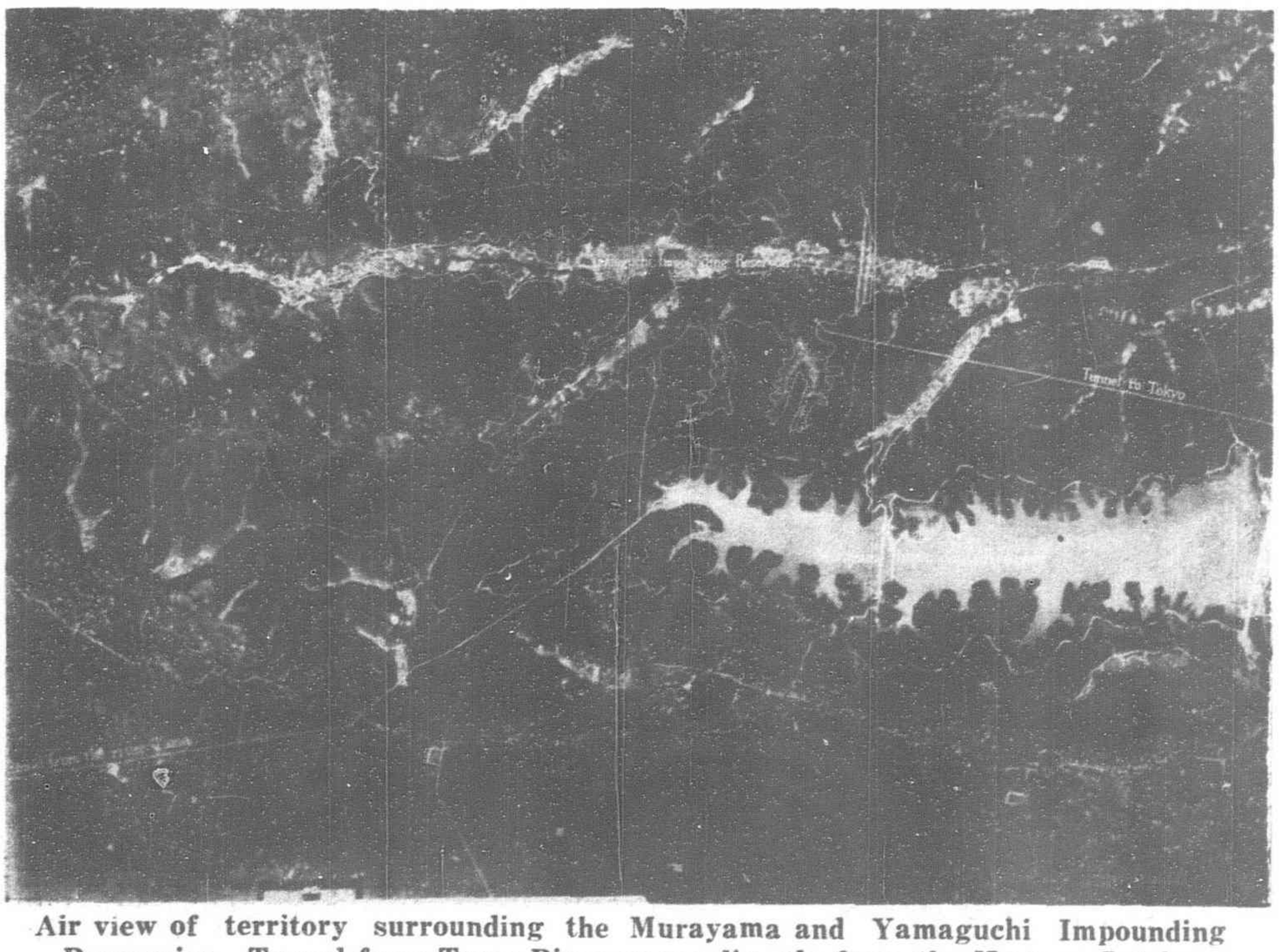
There were three proposed dam sites under consideration for Tokyo's new waterworks extension project. They are all along the upper reaches of the Tama River, Tokyo's chief source for water, and in a hilly, upland region. The farthest upstream site suggested is at the village of Tabayama, Yamanashi Prefecture; the midway site is that of Ogochi ; and the lowest downstream site is at the village of Kori, Tokyo Prefecture. The Ogochi site is also in one of the counties of Tokyo Prefecture.

Hamura Inlet for Raw Tama River water

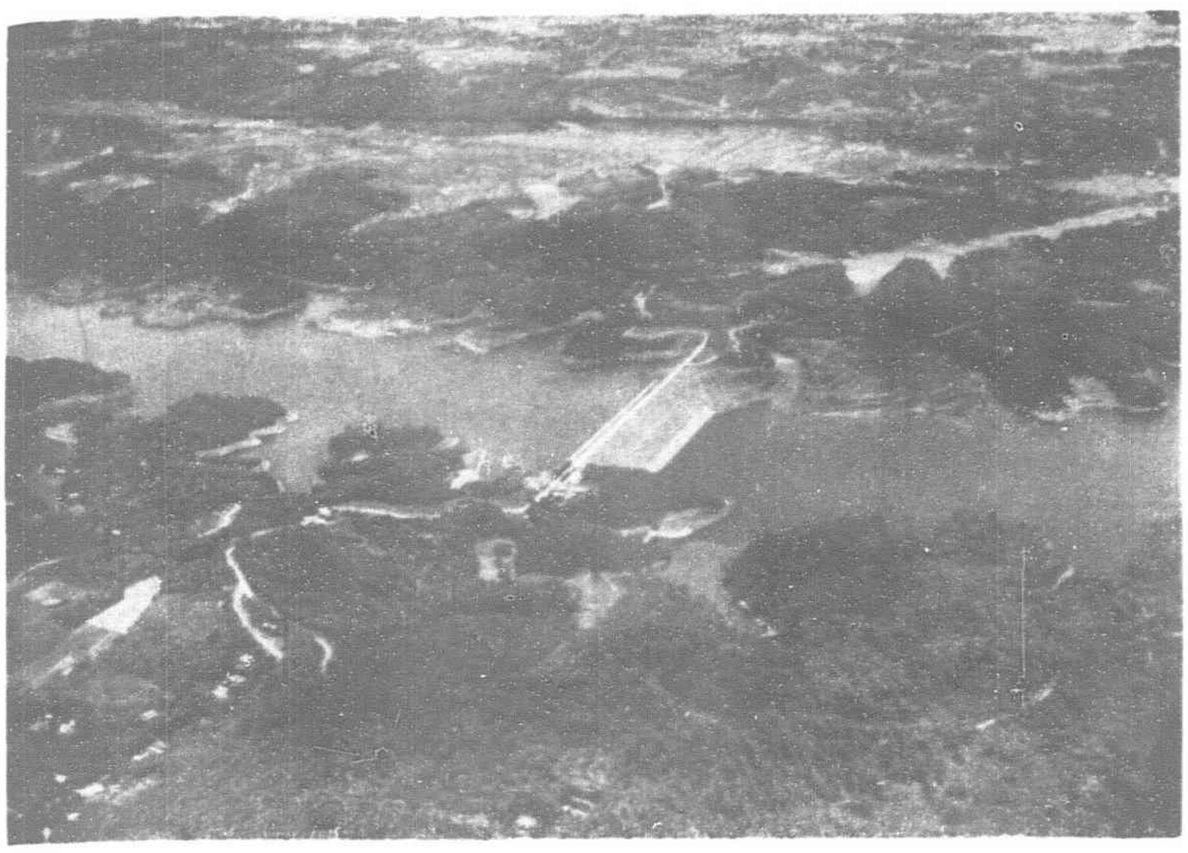
Since the Tabayama dam and reservoir site and the land contiguous to it is almost wholly undeveloped, expenses entailed in its improvement would have been relatively low for land, house and water rights. The Kori site has the advantages that its extensive drainage-area would have served well in controlling the volume of available water—the gentle slope of the Tama River at this point making it possible to lay out a comparatively large reservoir and at the same time build a dam low in height. In addition to this feature, construction material and labor could be transported to Kori with greater facility than to either of the other two locations. Existing conditions at the Ogochi site, midway between the other two, offered proportionate advantages as well as disadvantages.

Then, in the final decision between the superiority or inferiority of the upper, middle and lowest Tama River sites proposed for Tokyo's future water reservoir, the factor of favorable topographic features for a dam was given serious consideration. All of the sites were required to have practically equal efficiency in supplying water. It was natural that the further upstream a dam was built, the greater its height must be in relation to the diminishing drainage-area, potential pondage and the gradient of the river bed. Thus it did not seem expedient to construct a dam at the location farthest upstream along the river's course. Another matter to be considered was that the farther upstream a dam was built, the longer must be the length of the structure in direct proportion to the gradual narrowing of the Tama River valley, in keeping with an accompanying increase in its height.

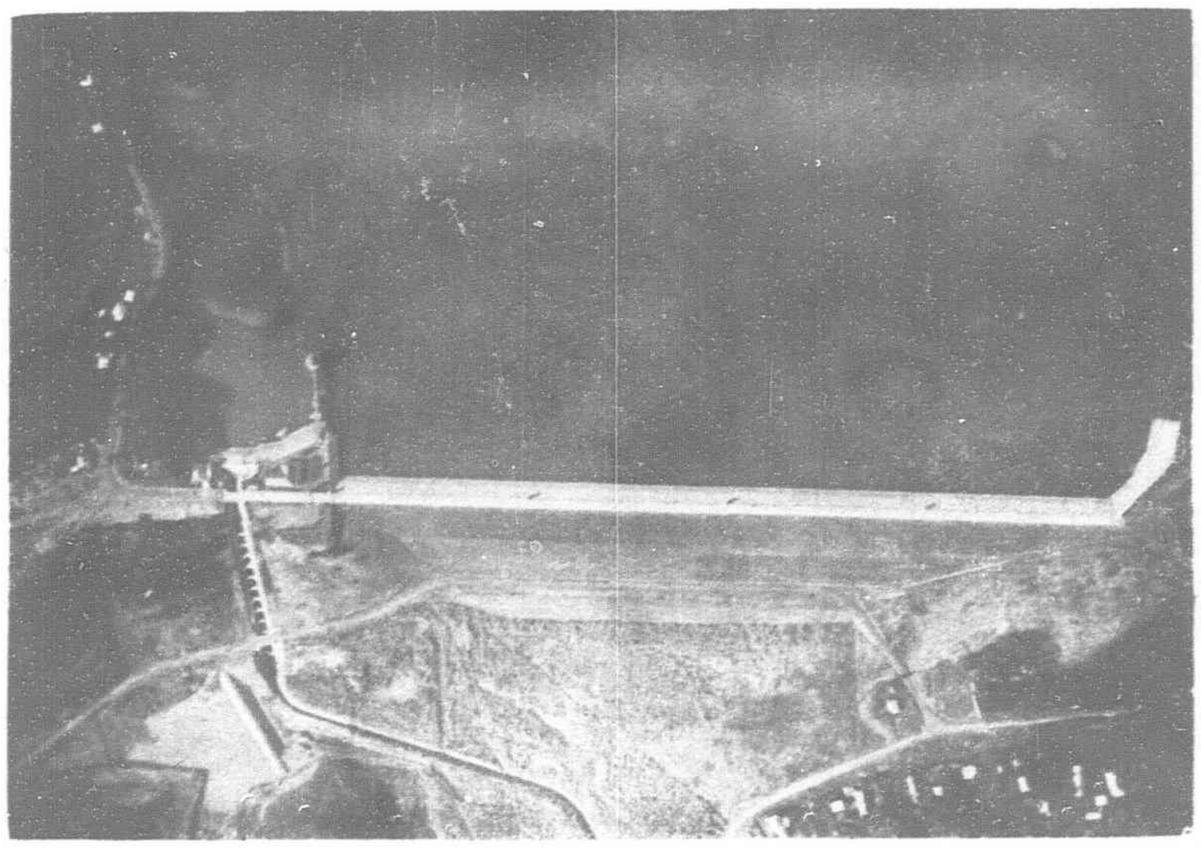
Upon reviewing the essential characteristics of the three sites, any appreciable difference between them was seen to be relatively slight. However, after surveying all three of the proposed locations, the middle site at the village of Ogochi was found to have the narrowest river width together with the most spacious, potential reservoir area.



Air view of territory surrounding the Murayama and Yamaguchi Impounding Reservoirs. Tunnel from Tama River comes directly from the Hamura Intake



Murayama Upper Dam and Twin Reservoir. Capacity, 444,000,000 Cubic Feet



Murayama Lower Dam and part of Reservoir

Furthermore, for the volume of water to be impounded, the Ogochi site provides the shortest span for a dam top—a length of 1,060 feet (323 meters). At Kori the top length would need to be 28 per cent longer than that and one at Tabayama 65 per cent longer. Consequently, the total estimated cost of reservoir and dam construction at Ogochi was found to be lowest of the three sites under question. As to which of them was to be chosen ultimately, other features of importance were compared and discussed besides that of economy of construction—and Ogochi was in the end decided upon.

Natural Foundations

The natural foundation of the Ogochi dam site belongs to the Chichibu stratum of palaeozoic rock and the so-called birdnest stratum, according to confirmation by the geological bureau of the Department of Commerce and Industry of the Imperial Government. These rock strata are composed mostly of hard sandstone, limestone and clay-slate, the presence of which makes the site geologically favorable for a dam foundation. Yet, in this respect all three of the sites proposed were found to be suitable for dam construction because of the uniform dip of their respective strata.

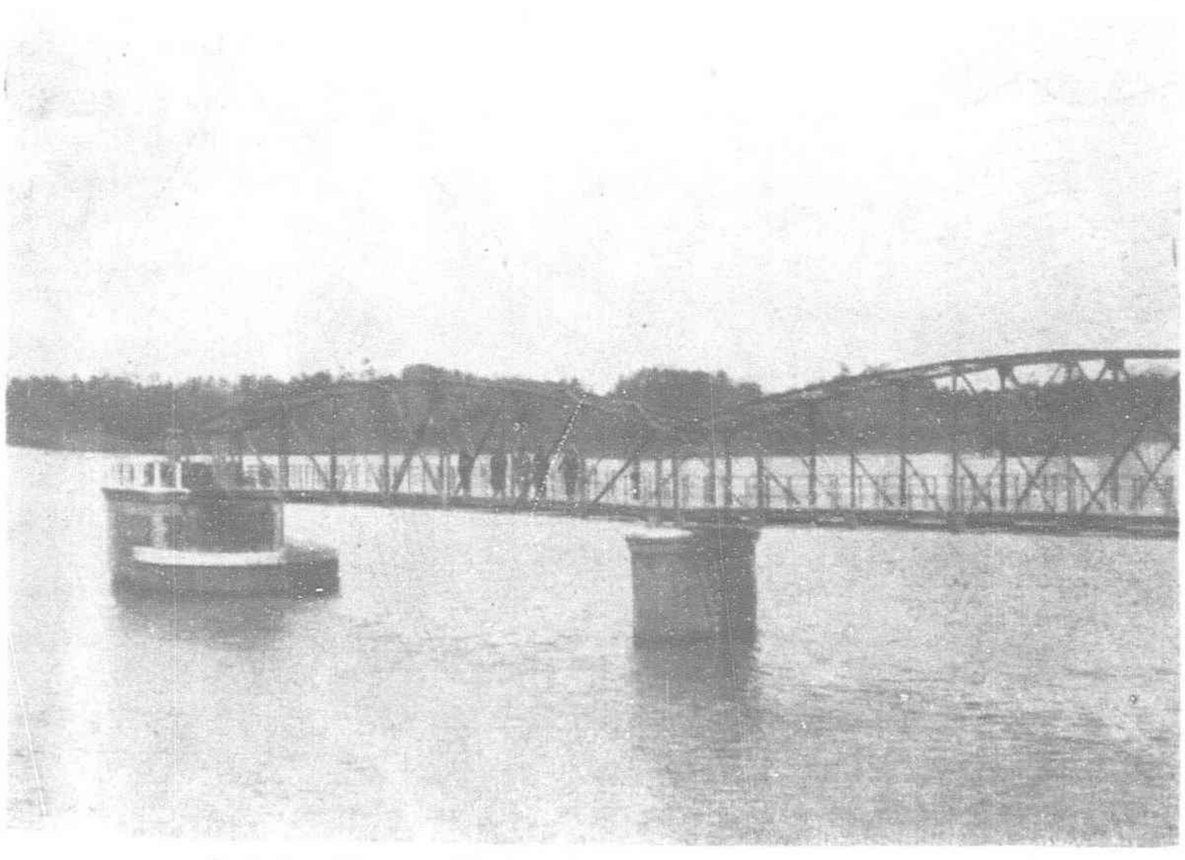
Rock strata all along the Tama River's course are exceptionally hard and, in consequence, earthquake resistant, is the ascertainment of the Central Meteorological Observatory in Tokyo. Young's mudulus of elasticity of limestone belonging to the local palaeozoic stratum is 6.58 (C.G.S. unit), which is two and one-half times higher than that in Gumma Prefecture, north-west of the city. Thus the Ogochi site is virtually free of displacement from ground movement less severe than a quake having an acceleration time of 500 m.m. per second/second to 1,000 m.m. per second/second.

Specifications for the Ogochi Reservoir :

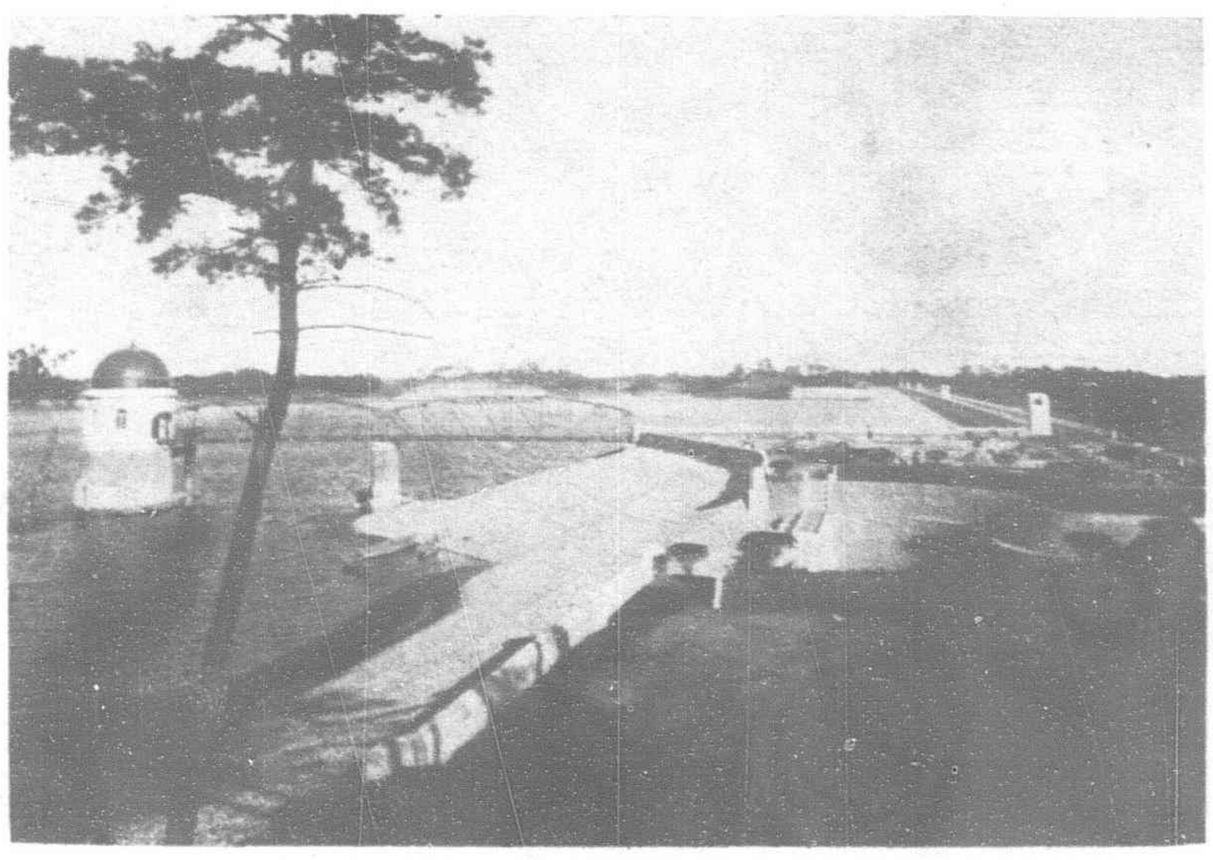
Full water capacity	6,594,228,690 cubic feet
Effective capacity	6,488,288,284 ,, ,,
Full water area	1,067 acres
Surface circumference	26.72 miles
,, length	5.97 ,,
Full water level above sea	1,837 feet
Low water level above sea	1,526 ,,
Bottom altitude	1,424 ,,
Water depth of basin	413.4 ,,
Mean water depth	142.06 ,,

Dam Specifications :

Type		Concrete gravity
Height from foot-cutting		440 feet
,, above bottom (reservoir bed)		430 ,,
Length at top (span)		1,060 ,,
Maximum cross-section	Thickness near top	26 ,,
	,, ,, bottom (base)	351 ,,
	Upstream batter (surface slope)	1 : 0.1
	Downstream batter	1 : 0.71
Approximate quantity of concrete needed		1,530,825 cubic yards
Cement grouting		4-in. in diameter, 5-ft. apart, to depth of 50-ft.

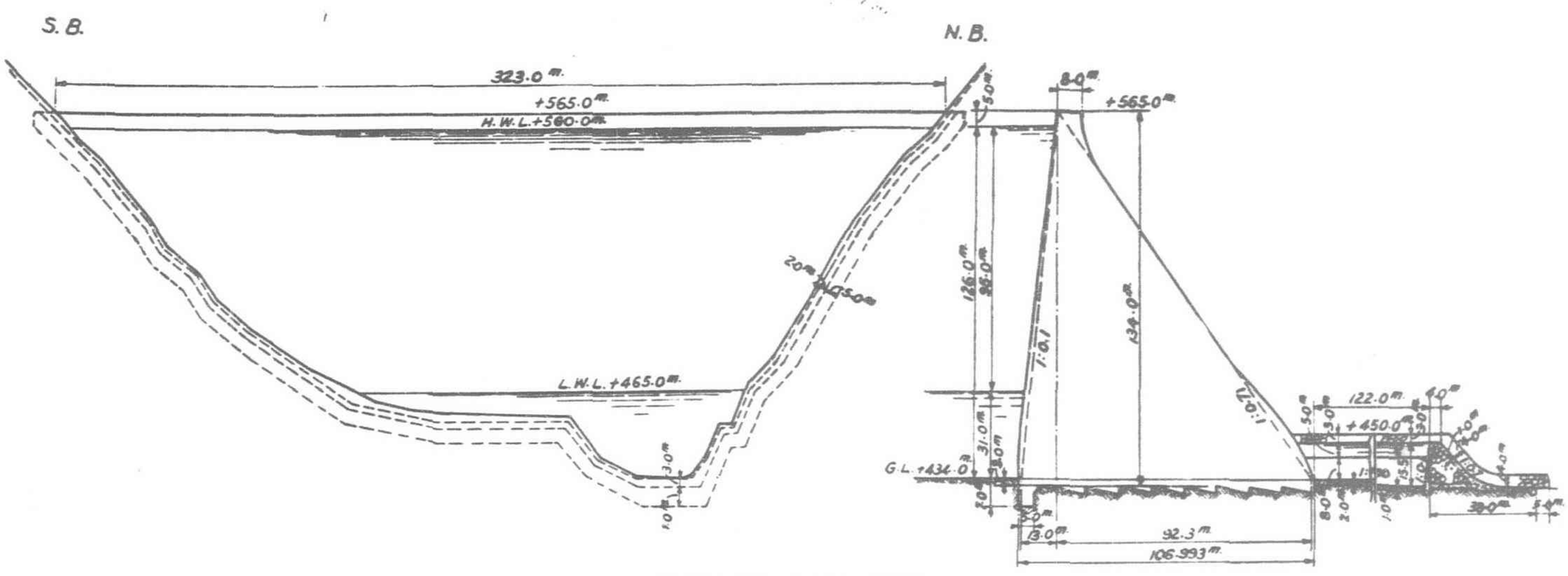


Intake Tower Upper Murayama Reservoir

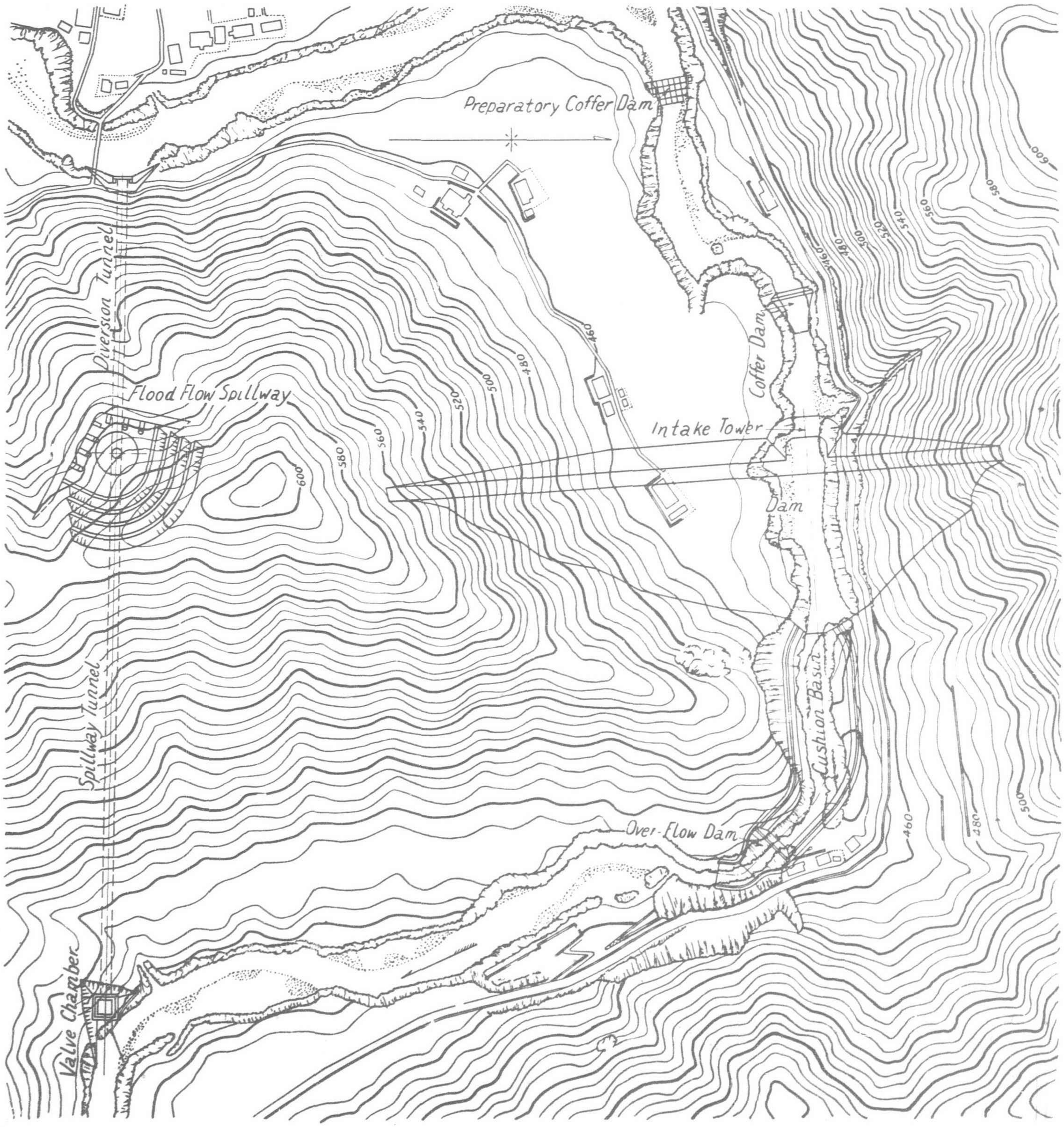


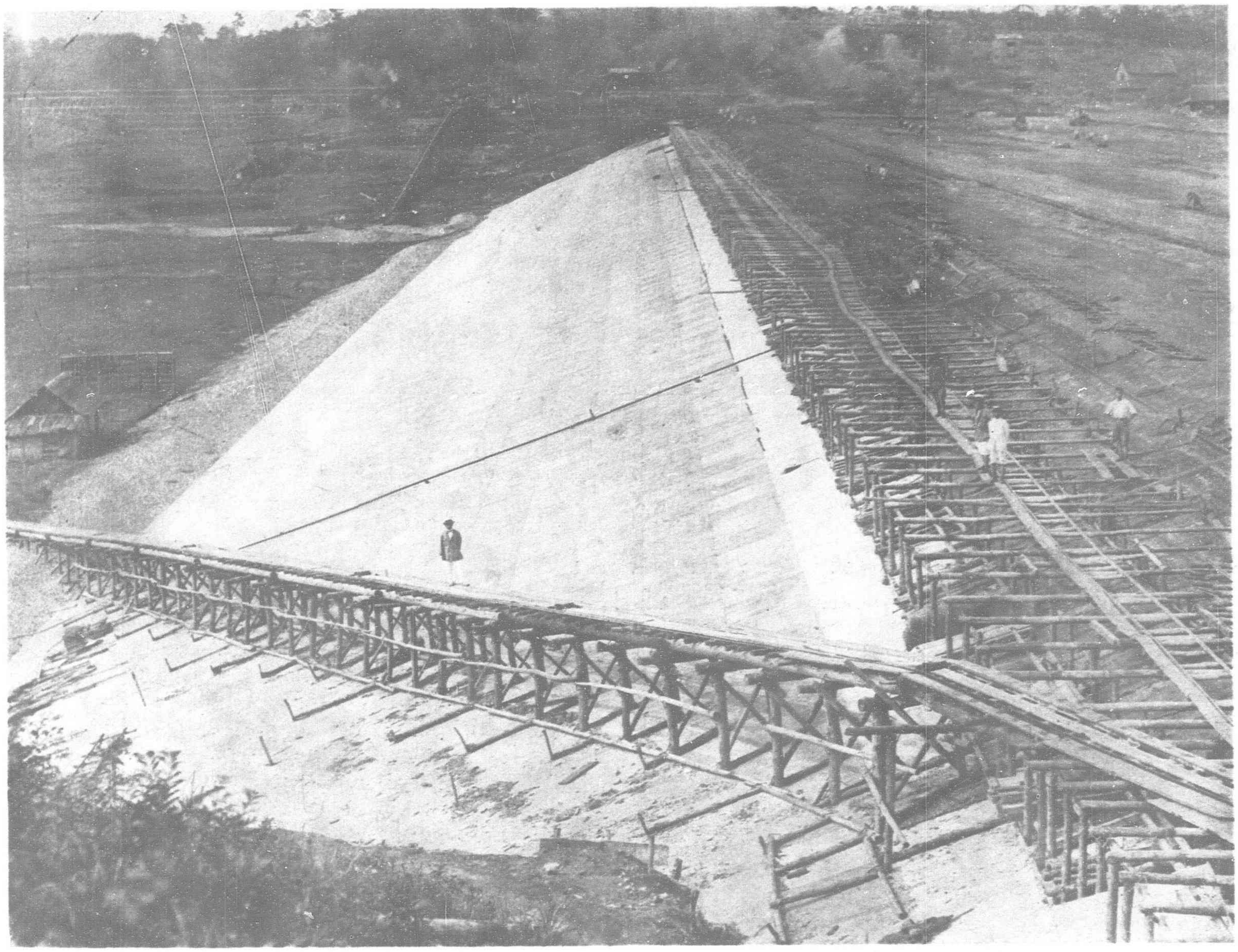
Intake Tower at Murayama Lower Dam

CROSS SECTION OF OGOCHI DAM



PLAN OF DAM SITE





Dam Top at Yamaguchi Reservoir now completed as it appeared while under construction

Comparative Analysis of the Three Tama River Reservoir and Dam Sites Proposed for Tokyo's new Waterworks Extension Project :

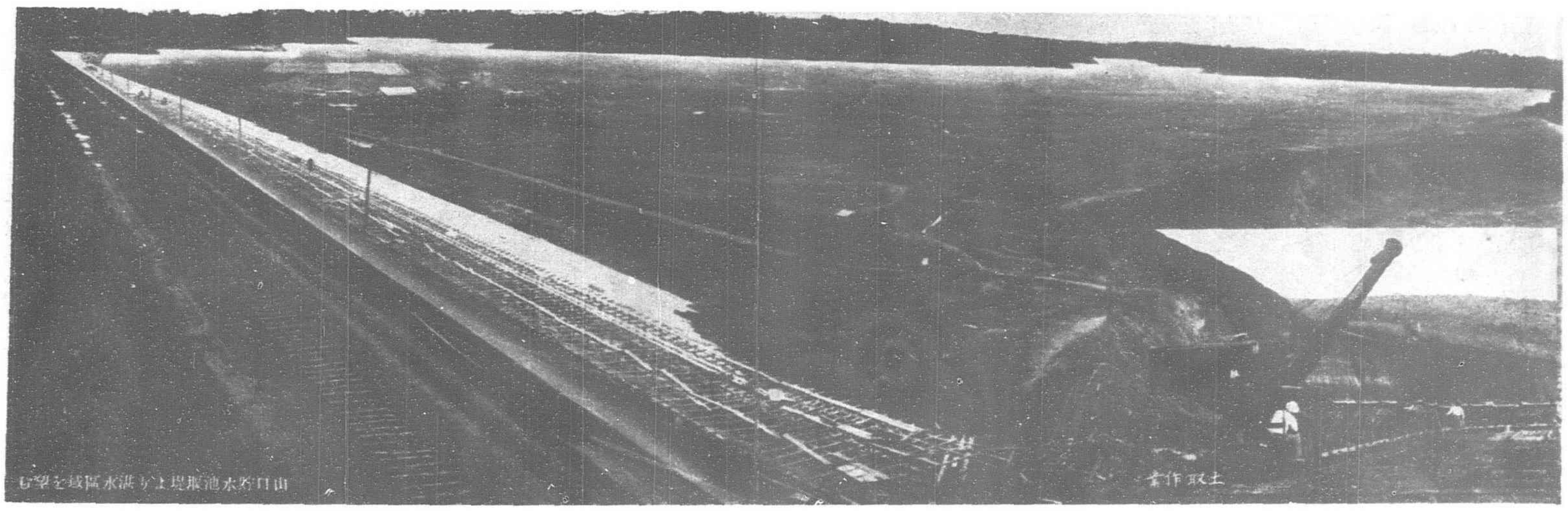
	Tabayama	*Ogochi*	*Kori*
Full Water Level Above Sea	2,448 feet (746 meters)	1,837 feet (560 meters)	1,066 feet (325 meters)
Effective Capacity	6,780,480,000 cubic feet (192,000,000 cubic meters)	6,488,288,284 cubic feet (184,000,000 cubic meters)	6,496,588,000 cubic feet (167,000,000 cubic meters)
Full Water Area	825 acres (334 hectares)	1,067 acres (432 hectares)	1,067 acres (432 hectares)
Height from Foot-cutting	528 feet (161 meters)	440 feet (134 meters)	390 feet (119 meters)
Length at Top (Span)	1,752 feet (534 meters)	1,060 feet (323 meters)	1,358 feet (414 meters)
Estimated Cost	Y.33,000,000	Y.22,000,000	Y.26,000,000
Number of Houses to be Moved	About 220	About 440	About 610

The water tower at Ogochi will be a straight, semicircular cylinder erected close to the body of the dam in front of its upstream surface. Two steel intake pipes and a lift for water will be installed. Each of these pipes is to have six branches in six vertical steps projecting out in a horizontal direction and passing through the cylinder wall, and thence opening into the reservoir. Each of these branch pipes will have a needle valve in a closely fitting aperture to be operated in discharging water from a suitable level to the downstream side of the dam when it is required.

Vertical shaft and spillway : Flood water will not flow over the dam crest but through a circular overflow dam. This water will then be permitted to flow downward into a straight shaft and out to the downstream side of the dam through a tunnel bored on a horizontal plane through bed rock. The tunnel will connect with the cylinder base near the low-water level. The spillway will open onto the upstream surface of the dam near the low-water level by means of another tunnel connecting with the base of the vertical shaft. The spillway flow will make it possible to discharge reservoir water through the flood-water discharge tunnel when it is found necessary to do so.

Hypothetic encroachment of shifting sand into the reservoir basin : The channel of the Tama River, as described above, is covered with hard bed rock of the Chichibu palaeozoic stratum, and the ground surface shows a comparatively thin layer of soil. On account of this land being little affected by earthquakes, there is but slight possibility of the completed reservoir becoming effectually less capacious from accumulating sand for many years to come. It is difficult, therefore, to make a reasonable conjecture as to the possible extent of sand encroachment.

The total area of collapsed ground along the Tama River's course is given as 309 acres. Presuming the average thickness of this collapse to be about three inches a year, its total mass reaches approximately 123,920.194 cubic yards. But any possibility of sand encroachments is not considered of primary importance for the reason that a sink covering 3,924,000 cubic yards of sand already exists at the bottom of the new reservoir site at Ogochi, in addition to the potential effective pondage which is provided for water. Precautionary measures to keep off sand are to be carried out in the construction of five auxiliary dams at strategic locations on the Tama River and its tributaries, which will feed the new reservoir.



New Yamaguchi Dam under construction. Reservoir to go into service March, 1933. Capacity, 636,000,000 Cubic Feet

STRENGTH OF BED ROCK AT THE OGOCHI SITE

Specimens	*Average Diameter*	*Length*	*Sectional Area*	*Load (Metric tons)*	*Maximum Strength Against Pressure*
Hard Sand Rock	1.84-in. (4.66 cm.)	1.97-in. (5 cm.)	2.644 sq. in. (17.055 sq. cm.)	49.5	18.722 lbs. per sq. in. (2,902 kilograms per sq. cm.)
Clay-slate	1.84-in. (4.66 cm.)	1.97-in. (5 cm.)	2.644 sq. in. (17.055 sq. cm.)	18.4	6.959 lbs. per sq. in. (1,079 kgs. per sq. cm.)
,,	1.83-in. (4.65 cm.)	1.97-in. (5 cm.)	2.632 sq. in. (16.982 sq. cm.)	20.6	7.827 lbs. per sq. in. (1,213 kgs. per sq. cm.)
Average	—	—	—	—	11.169 lbs. per sq. in. (1,146 kgs. per sq. cm.

The new extension project for the Tokyo waterworks was originally based on an opinion handed down in March, 1926, by the municipal assembly. The public had hoped for some time that those in authority would adopt a progressive plan to augment the city water supply. In 1926 a second extension program was underway and the Yamaguchi impounding reservoir together with its accessory works was then half completed.

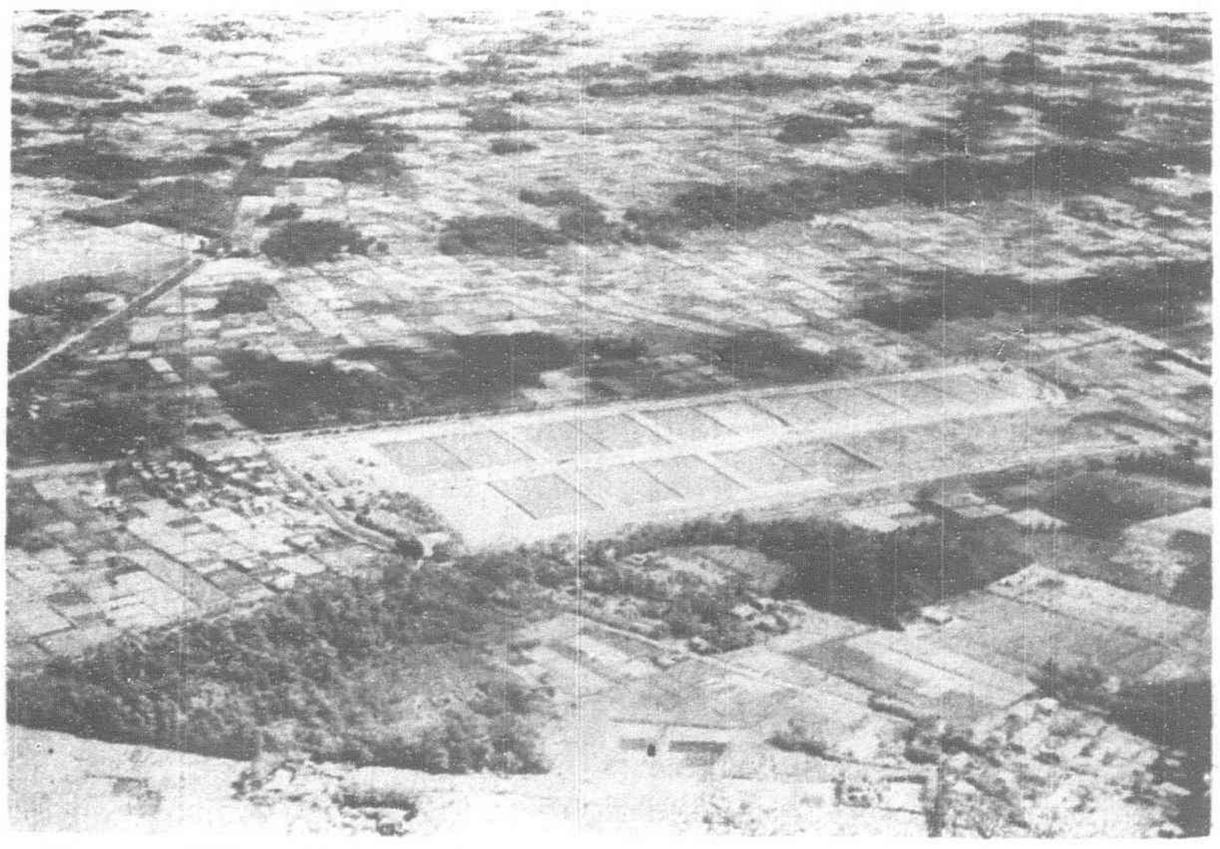
The effective capacity of the three reservoirs now in use (two at Murayama and one at Yamaguchi) is not more than 17,280,000 cubic feet of water daily, while 15,300,000 cubic feet of water was in 1926 actually consumed in the city every day. Such being the case, it was found necessary to determine again whether the existing source of supply would not become insufficient for the needs of Tokyo within a comparatively few years.

Past Measures Reviewed

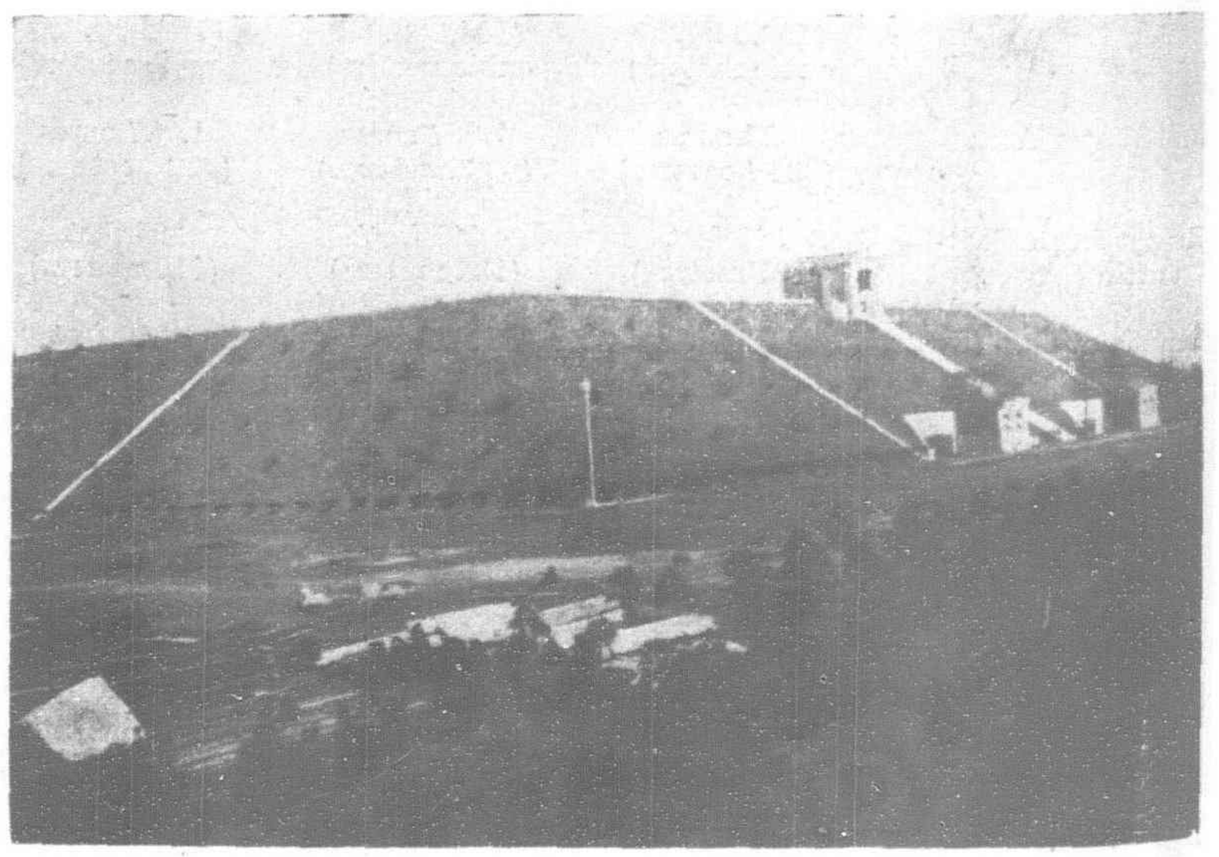
On the other hand, in the former suburbs of the city, the Tama River Waterworks company since 1919 had heen supplying water to the town of Shinagawa (now part of Shinagawa Ward) as well as to 13 neighboring towns and villages. The Shibuya Waterworks Bureau since 1923 had furnished the town of Shibuya (now part of Shibuya Ward) and the town of Meguro with water. Since 1926, the Yedo River Waterworks company had supplied the town of Kameido and 11 other communities in the vicinity. And the Aratama Waterworks organization was preparing to supply water to the town of Nakano and 12 other neighborhood towns. Moreover, with unusual enterprise after the 1923 earthquake, numbers of other towns within Tokyo's former suburbs were formulating additional plans for adequate water supplies. So from the standpoint of health and hygienic requirements in the city, this tendency might be commended, but considering other angles, such as that of the metropolis as a corporate unit, it was not considered advisable, either from the point of view of financing or of operation, for an increasing number of water companies under independent managerships to spring up within the metropolitan area.

Because of the existence of these suburban water companies, it was already too late to inaugurate some fundamentally ideal plan for supplying water to greater Tokyo at the time the abovementioned second extension program was launched.

First of all it was decided to carry out a systematic plan, in as efficient a way as possible, to supply water to the former city planning area of Tokyo, now a part of the city itself, and make use of existing facilities in suburban quarters—both those that were already in operation as well as those that were about to be started. As a part of this plan it was further decided to carry out an extension project for the municipal waterworks. In 1931 the realization of these plans was practically complete.



Twenty Filter Beds at Sakai Station, five of which will be completed March, 1933.



Old Wadabori service of Distributing Reservoir. Capacity, 1,500,000 Cubic Feet

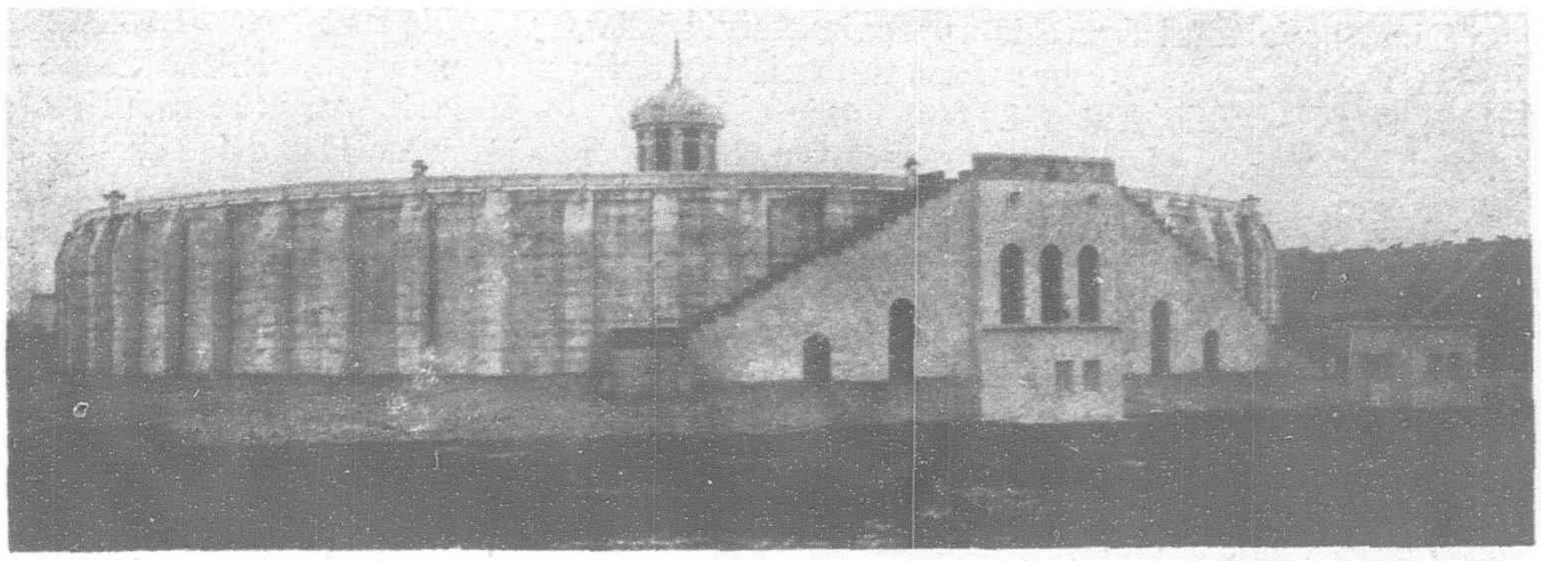
An initial problem confronting the city waterworks bureau in preparing for the future was an available source for more water. Besides the Tama River, from which Tokyo gets most of its water, there is the Tone River, largest in the Kwanto (Eastern) district and less than 25 miles from the city; the Sagami River in a south-easterly direction, originating in the foothills of Mt. Fuji and having a relatively uniform annual flow, and the Arakawa in the north-west, rising in the Chichibu mountains and traversing the city.

Judging from the existence of these different water sources, it might be supposed that sufficient water could be easily obtained for Tokyo, no matter where one turned. Yet, in countries that are as highly developed as Japan is, industrially as well as agriculturally, available rivers are reserved for numerous uses, and it would hardly be feasible to draw large quantities of water from them for entirely new purposes without some effective arrangement whereby to limit and control the volume of water desired. Therefore it did not seem to be a safe procedure to rely for Tokyo's water solely upon the Tama River, the available flow of which had been considerably reduced within recent years, because it had been drawn upon practically to the exclusion of other nearby sources. Thus it was that the rivers Sagami, Tone and its branch, the Yedo, had been employed as additional water sources.

For the above reasons, it was difficult to draw a sufficient volume of additional water from either of the rivers mentioned, and furthermore, the various projects suggested had their defects as well as merits. It became increasingly evident that time must not be wasted in view of the imminent scarcity of water in the metropolis.

Under the urgent need for immediate action, a satisfactory method of control was devised to regulate the Tama River flow along its upper reaches and at more than two score miles from the heart of the city. This is to be done by means of an immense impounding reservoir laid out athwart the course of the Tama at the Ogochi super-dam site.

According to the above plan, Tama River raw water, once under control in the Ogochi reservoir, will be let out into the river again to flow to a point about 25 miles further down its course, be taken in at Hamura, the present intake, to pass through the Hamura-Murayama conduit line and thence flow into the Murayama and Yamaguchi impounding reservoirs. The water will be filtered in the Higashi-Murayama (East-Murayama) filter beds to be constructed as a part of the new project, and the clear water will from there be conveyed into the city through large caliber steel pipes.



New Wadabori Service Reservoir completed July, 1932. Capacity, 1,500,000 Cubic Feet

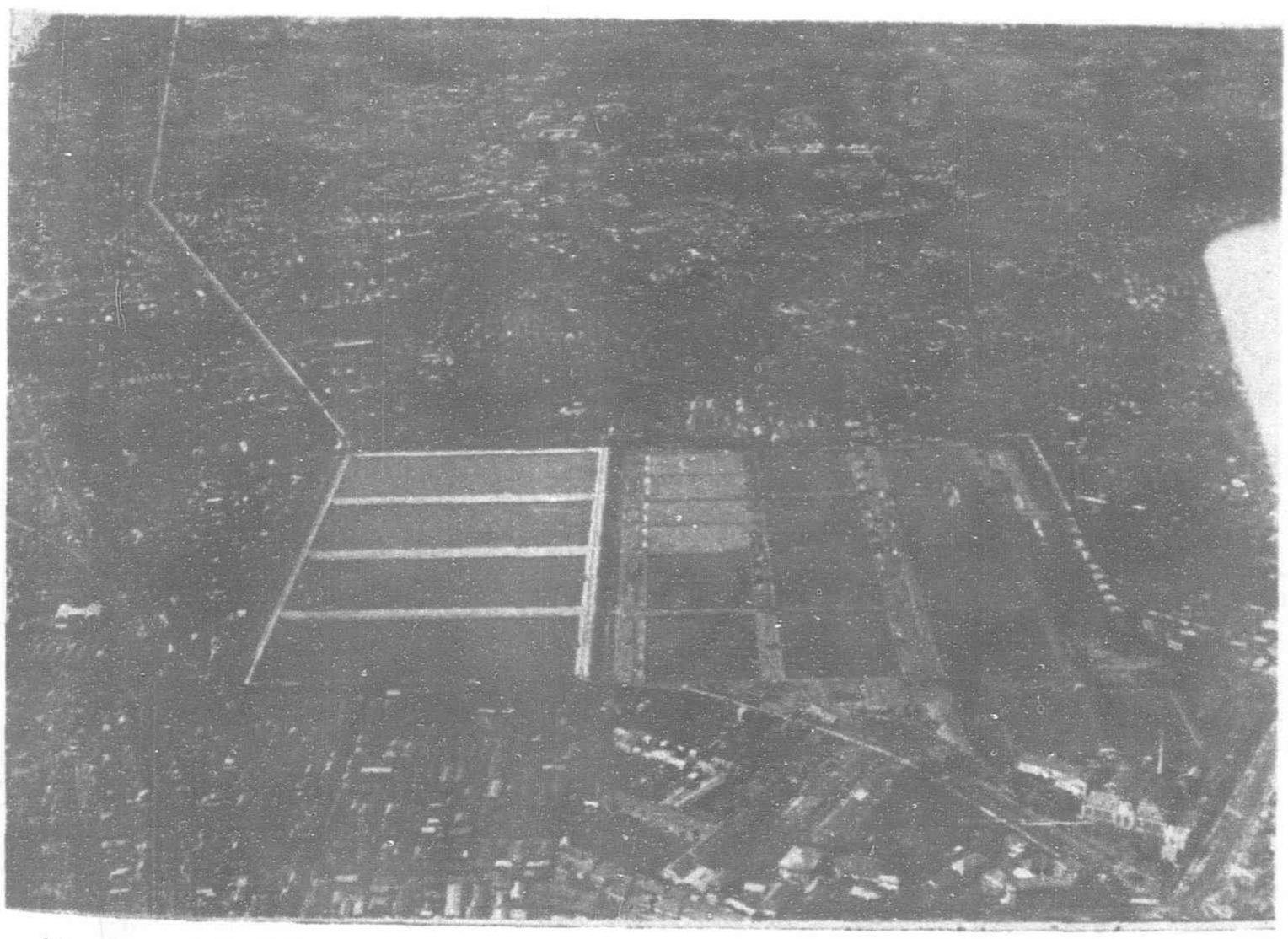
In their relation to the recent expansion of the city of Tokyo, these new extension plans of the municipal waterworks bureau are designed to supply sufficient water for a saturant population estimated within 20 years. With the progress of the plans, a considerable surplus will arise during the next two decades. This surplus, together with the water capacity of existing works in the suburbs, will be ample to supply the newly acquired districts of Tokyo, which are divided into 20 wards almost encircling the city.

Relation between the necessary water supply for Tokyo's future and the Tama River flow:

The supply of water necessary for the future is estimated by the maximum volume of water daily per capita multiplied by the saturant population. The maximum volume of water daily per capita in the city—which reached 64 gallons (255 liters) last summer—tends still to rise. According to this tendency it is expected to reach about 84 gallons (320 liters) within the next few years, or to be augmented by about 25 per cent as compared with the present. Increase in the volume of available water will of course be due much to the growing use of modern plumbing equipment; but, above all, to the popular acceptance of sanitary flush toilets. The result of a recent inquiry indicates that out of a total number of 420,000 houses in the city, 12,732 are equipped with flush toilets. That represents only five per cent of the total. But, after every dwelling is thus equipped, authorities believe that the volume of water required will rise by at least 20 per cent. In this event, the regular maximum supply of water for Tokyo will not be sufficient to meet the demand. This holds true because the remaining surplus will be only five per cent, since a deduction of 20 per cent, corresponding to the water used by flush toilets from the above estimated 25 per cent surplus, must be made.

If Tokyo's commuting population numbering about 850,000, is taken into consideration, the maximum daily water supply per capita will be 62 gallons (233 liters), computed upon the net population of the former city of 15 wards, and as compared with the above 84 gallons (320 liters), it will rise by a surplus of 38 per cent.

The future population of the former municipality—with an area of 31.4 square miles—is expected to reach 2,302,900, computed upon the present density of population for the 15 old wards of nearly 1,000 per 8.26 acres (10,000 tsubo), which has been determined by the city planning commission.



Air view of Yodobashi Station with its four Settling Basins and 24 Filter Beds. Capacity, 8,640,000 Cubic Feet each day

Other Calculations

The maximum daily water supply is arrived at by multiplying the above estimated maximum per capita supply, that is 84 gallons (320 liters), with an estimated future population of 2,700,000 for the 15 old wards of Tokyo. This amounts to 31,000,000 cubic feet (864,000 cubic meters). The total volume of water daily required for the city and the neighboring four towns of Yodobashi, Sendagaya, Okubo and Totsuka amounts to 32,510,000 cubic feet (906,000 cubic meters), since the maximum volume of water needed daily for a saturant population in these towns, viz., about 210,675 inhabitants, is nearly 1,510,000 cubic feet (42,000 cubic meters).

The above total figure is approximately 15,300,000 cubic feet (426,000 cubic meters) more than the existing daily water supply of 17,280,000 cubic feet (480,000 cubic meters). It indicates a needed increase of about 90 per cent for the present. If we add 15 per cent to these figures in converting the maximum daily water supply to the raw water supply, it is necessary to multiply the amount by .78 in converting to the mean volume of raw water per annum. Lastly, convert the resultant figures to the flow per second : then the volume of water necessary for present requirements amounts to 192 cubic feet (5.43 cubic meters), the amount that will become necessary in the future to 141 cubic feet (3.984 cubic meters) and the total amount to approximately 333 cubic feet (9.414 cubic meters).

In this connection, the Tamagawa-Josuiro (Tama River irrigation canal) cannot be overlooked as an accessory to the Tokyo city waterworks. This aqueduct existed as an important water service line during the Yedo eras and its tributary lines are still used for irrigating purposes on the plain of Musashino, where Tokyo is built. The average necessary volume of water for irrigation within the present environs of Tokyo is computed at about 132 cubic feet per second (3.743 cubic meters). Thus there is now being derived from the Tama River 192 cubic feet (5.430 cubic meters) of water per second as service water and 132 cubic feet (3.743 cubic meters) per second for the Tamagawa-Josuiro. These amounts come to a total of almost 314 cubic feet (9.173 cubic meters) per second. In the future 465 cubic feet (13.157 cubic meters) of water will be required as a result of the extension project, the execution of which will furnish 142 cubic feet (3.984 cubic meters) more water per second.

The Tama River flow measured at Hamura, the present intake, was greatest in 1928, showing 1,351 cubic feet (38.246 cubic meters) per second on an average throughout that year, and the smallest in 1926 at 353 cubic feet (9.985 cubic meters). The average through 16 years was 797 cubic feet (22.579 cubic meters) per second. Therefore the total consumption of the existing waterworks and the Tamagawa-Josuiro combined is 324 cubic feet (9.173 cubic meters) per second, which is about 46 per cent of the average flow of the Tama River. The figures for future consumption of 465 cubic feet (13.157 cubic meters) per second is about 58.3 per cent of the above indicated average flow of the Tama. So, in the final analysis, it becomes a feasible undertaking to carry out an adequate water supply system deriving its raw water from the Tama, for which a new impounding reservoir of considerable capacity will be constructed to regulate the flow of the river in the flood season and discharge it in the dry season of the year.

According to the above conclusions, during 20 months, from December, 1925 to July, 1927, water in the Tama River was at its lowest ebb. In consequence there was a deficiency of 4,450,-000,000 cubic feet (126,000,000 cubic meters). The new dam and reservoir, soon to be under construction at the Ogochi site, will completely eliminate this deficiency by storing approximately 6,600,000,000 cubic feet (186,720,000 cubic meters) of water.

During the last half of July and in August, 1932, representing the peak of the hot weather season on the plain of Musashino, Tokyo consumed close to 20,400,000 cubic feet (565,000 cubic meters) of water every day from the municipal supply. This did not include an additional 9,429,105 cubic feet (267,000 cubic meters) consumed daily by the then suburban communities and some of the outlying wards of the city, which were served by four principal independent companies, soon to be absorbed by the city waterworks bureau.

The total daily consumption of water in the greater Tokyo area reached between 33,480,000 and 35,280,000 cubic feet (930,000 to 980,000 cubic meters). Under existing plans of the waterworks bureau for a future population, the maximum daily supply of water is estimated as 54,000,000 cubic feet (1,500,000 cubic meters) or about triple the current supply.

The Tama River watershed extends partway over the western counties of Tokyo Prefecture and a portion of Yamanashi Prefecture, extending back into the mountains for some 46 miles. The intake, situated at the village of Hamura, diverts about 40 per cent of raw river water from its course, letting it flow directly into an open supply canal leading to conduit tunnels and the reservoirs. Formerly the independent water companies drew another 15 per cent from points further down the Tama. To leave a reasonable quantity of water in the river, the remaining 45 per cent of its volume was left to flow downstream toward Tokyo bay.

In July and August, the hottest part of the summer, water in the Tama River is most plentiful ; as it is at its lowest ebb in the month of January. The intake is designed to accommodate a maximum flow of 802.8 cubic feet (22.3 cubic meters) of water per second. But the river water decreases in times of drought, hence the necessity of large impounding reservoirs to store an adequate supply of water under control.

River water collected at the intake flows through the Hamura-Murayama conduit, consisting of canal and tunnels, and arrives at the Murayama and Yamaguchi containing or impounding reservoirs. From here the water passes along the Murayama-Sakai line, by culvert type conduit, to the Sakai filter station, where part of the water is filtered and conveyed through the Sakai-Wadabori line culvert to be stored in the two Wadabori service reservoirs.

Water is supplied directly to the various wards from this point by two sixty inch cast iron trunk mains leading to the different districts of the city.

The remainder of the water at the Sakai filter station is turned into an open canal and flows to the Yodobashi filter station. After being filtered here, the water is supplied to other districts by two forty-four inch and two thirty-two inch cast iron trunk mains.

This open canal is part of the Tamagawa-Josuiro, which was dug across Musashino plain from Hamura to Yedo (Tokyo to-day). It was about 25 miles in length, completed at great expense and required almost two years of labor.

This supply line, Tokyo's first aqueduct, part of which now connects Hamura intake and Yodobashi filter station, was the only one until more than a score of years ago when the former extension works now complete were begun in 1911. A section of this old canal, from Sakai to Yodobashi, is still used as a raw water conduit ; but on completion of the culvert-conduit now under construction, it will be utilized only as a means of spare water supply.

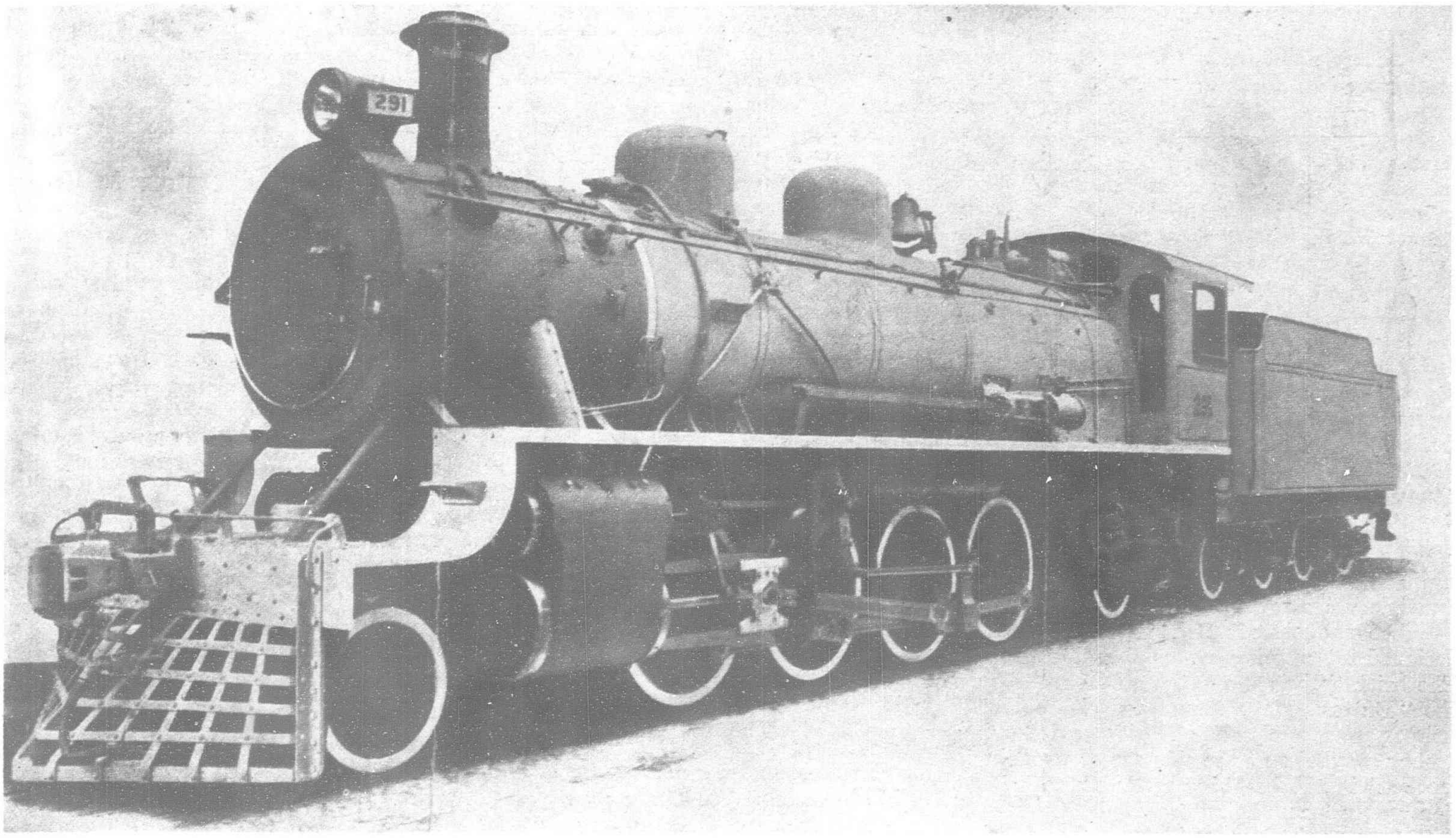
The principal source of Tokyo's water to-day are the Murayama twin-reservoirs about 15 miles distant from downtown Tokyo in a north-westerly direction. They have a combined capacity of 444,000,000 cubic feet of water. In an adjoining valley the Yamaguchi reservoir, now practically completed, has a pondage of 636,000,000 cubic feet more of water from the Tama River. It will be in service by March this year. Reservoir accommodation totalling 1,100,000,000 cubic feet of water will then be available for the city of Tokyo.

The two filter stations of Yodobashi and Sakai consist of settling basins to provide for sedimentation and a series of filter beds. The former station has a service reservoir having a water capacity of 1,000,000 cubic feet in addition to its four settling basins and 24 filter beds. Sakai station is equipped with 15 filter beds, with five more to be completed by March, 1934.

At Wadabori there are two service reservoirs with a total capacity of 3,000,000 cubic feet. One of these with its 1,500,000 cubic foot capacity went into service in July, 1932. Two smaller reservoirs receiving filtered water directly from Yodobashi station, one in Shiba Ward and the other in Hongo, each have a capacity of 1,000,000 cubic feet of water. All of these stations employ natural flow or gravitation in supplying the various wards of the city, except Yodobashi station, which has the pumping system. Here auxiliary collecting pumps and filtered water pumps are installed. The municipal waterworks bureau of Tokyo collects water by gravitation and supplies most of the downtown districts of the city by this means, but the uptown sections are served by pumps.

Chiefly during winter months when the weather is comparatively dry, there is a serious decrease in the Tama River flow and a resultant shortage of water supply. To help normalize this seasonal discrepancy, the large impounding reservoirs were built at Murayama and more recently at Yamaguchi as extension works. Yet the supply of water to meet the demands of a continually increasing population in Tokyo is still insufficient and far short of requirements when dry periods succeed each other too often. For this reason auxiliary collecting plants for temporary or emergency use have been provided ; but even they have not been able to bring up the supply to adequate proportions. One is at Inokashira pond in Suginami Ward, and serves to pump up the water from this pond : the second is at Hamura near the intake, while the third is within the precincts of Yodobashi station. Both of the latter auxiliary plants serve to pump ground water.

(Continued on page 143)



Notable New Locomotives for China*

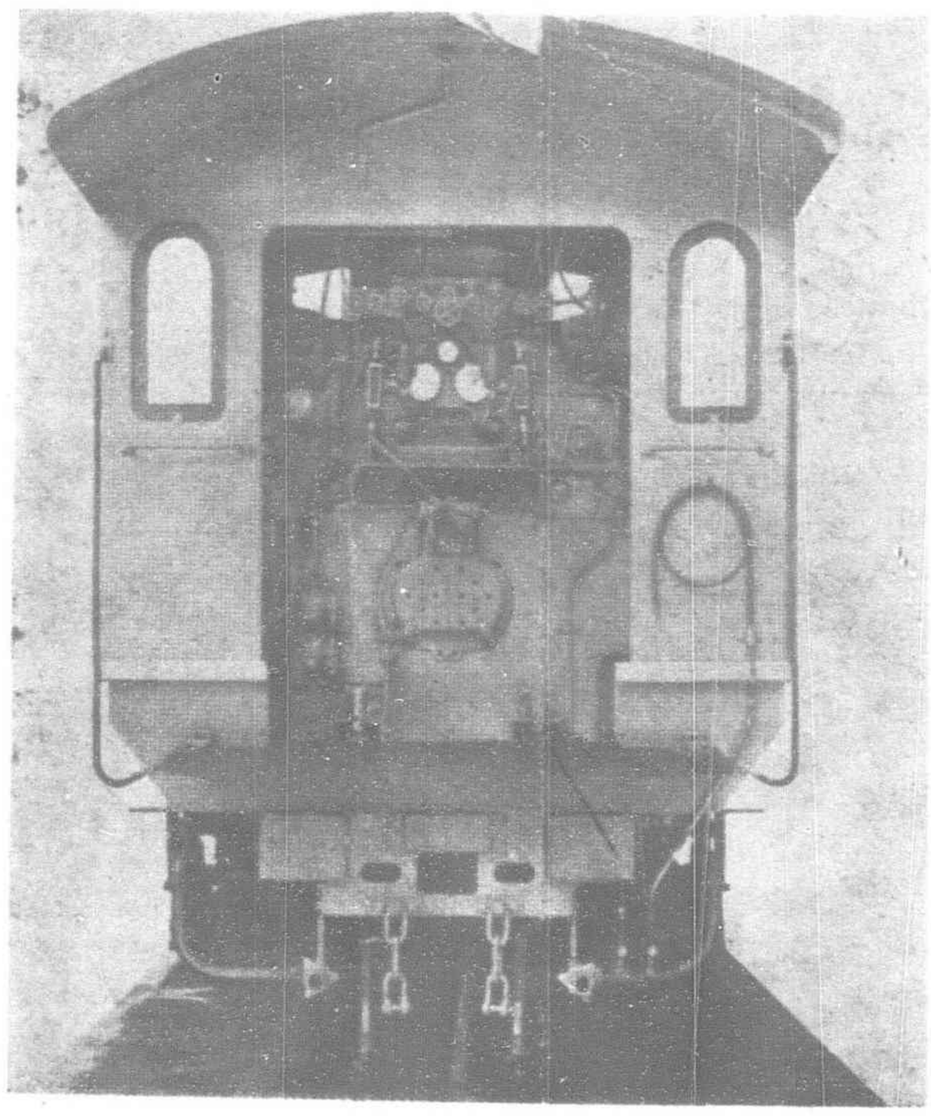
Eight interesting engines constructed by Nasmyth Wilson & Co., Ltd., for service on the Chinese Government Railways

A CONTRACT for eight 2-8-2 type heavy mixed traffic locomotives for service on the 4-ft. 8½-in. gauge is just being completed at the works of Nasmyth Wilson & Co., Ltd., Patricroft, Manchester. They were shipped, fully erected, from Manchester on Wednesday, December 14, special arrangements having been made for their transit over the L.M.S.R. to the Manchester Docks which, owing to their being out of load gauge, involved a slewing of tracks and also a lowering of the rail level at several points.

The engines have been constructed to the order of the Chinese Government Purchasing Commission for the Ministry of Railways, China, out of the China Indemnity Fund, or, as it is sometimes called, the Boxer Indemnity, the Consulting and Inspecting Engineers being Messrs. Sandberg, of Grosvenor Gardens, London, S.W.1.

Locomotives of this description have been supplied to China in the past by American locomotive building firms and in the construction of this new series American drawings have been primarily worked to. A condition of the contract was that the dynamic augments at 45 m.p.h. must not exceed 15 per cent of the static load of any one pair of coupled wheels.

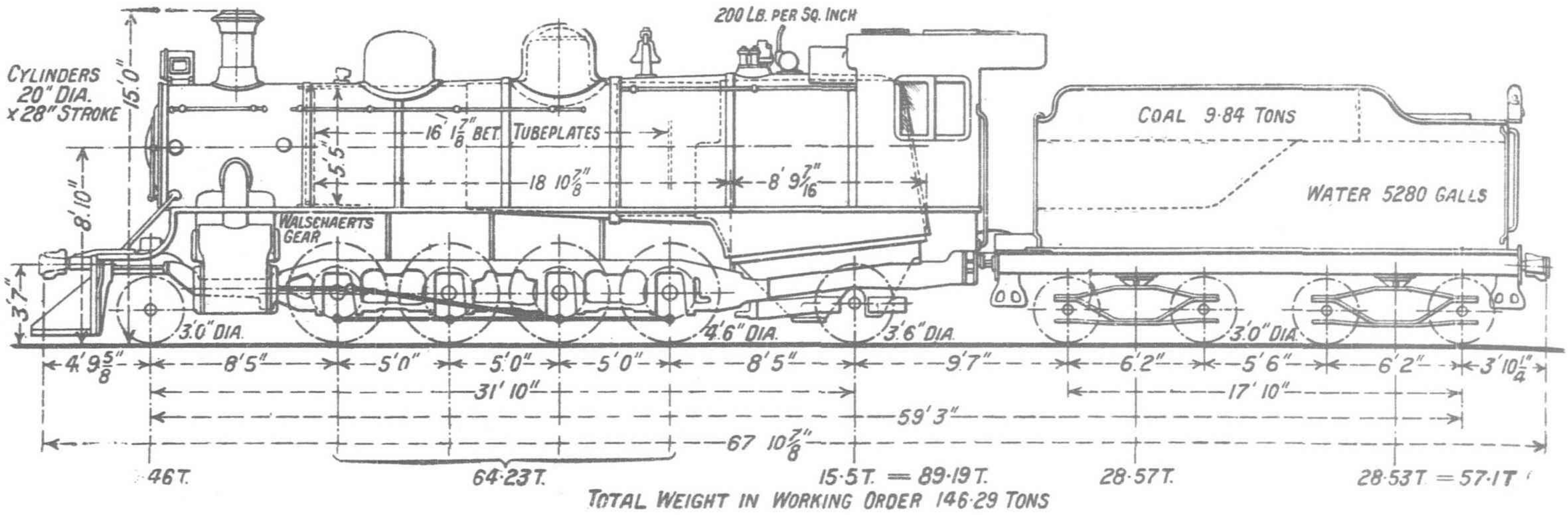
The engines are of large size and the equipment is very complete. They have bar frames cut from solid forged steel, the thickness being 4-in. The cylinders, as the photograph and drawing show, are placed outside the frames and drive the third pair of coupled wheels. Steam distribution is effected by 11-in. diameter inside admission piston valves. Walschaerts valve gear being employed. The cylinders are cast integrally with the valve chests and smokebox saddle, the cylinder barrels and valve chests being fitted with liners. Automatic steam-operated cylinder drain cocks and British made, crescent-type metallic packing are fitted. The drifting valve is provided with connections to the cylinders and water relief valves are placed on the cylinder covers. The reversing gear is of the single cylinder power type, air or steam operated. The driving wheels are fitted with bronze hub liners and the axleboxes are of cast steel with bronze bearings and the axlebox guides have adjustable wedges. The coupled-wheel springs, placed above the axleboxes are compensated. The crank pins and piston rods are made of carbon-vanadium steel. The leading truck is of the swing link type and the hind truck of the radial arm type. Air valves are mounted on the steam chest.



View of Locomotive Cab

The boiler, the center line of which is 8-ft. 10-in. above rail level, has a diameter next the smokebox of 5-ft. 5-in. inside and a length between tube plates of 16-ft. 1⅞-in. The section of the barrel next the firebox is tapered and the firebox itself is fitted with a combustion chamber. The boiler is of steel throughout and carries a working pressure of 200 lb. per sq. in. The tubes

* *The Railway Gazette.*



Dimensional Drawing of the Locomotive

are of solid drawn steel and the superheater is of the M.L.S. pattern supplied by the Superheater Co., Ltd., having the header and multiple valve regulator combined.

The smokebox is fitted with a spark arrester. The firebox is designed for burning soft coal and is fitted with a rocking grate. The brick arch is supported on arch tubes and the fire door is of the " Butterfly " type operated either pneumatically or by hand. Ashpan and coal water sprinkler injectors are provided. The firebox staybolts at the side are of wrought iron and flexible stays are used in the breaking zones, these being also of wrought iron, 4-in. water spaces being provided. Cleaning holes with large wash-out plugs having screwed caps and two blow-off cocks figure in the equipment, as does also a steam turret having separate chambers for saturated and superheated steam. There are three pop safety valves and near them is located a five-chamber chime whistle. The boiler is fed by two non-lifting injectors delivering into a top feed clackbox placed at the front end near the smokebox.

A dual pressure gauge with connections to the cylinder exhaust and steam passages is mounted alongside the boiler pressure gauge, together with steam heating pressure gauge above them. A steam boiler tube cleaner figures in another item in the equipment. A five-feed sight feed lubricator with connections to the cylinder barrel, steam pipes and Westinghouse pump, is located in the cab and every provision has been made for the comfort and convenience of the enginemen. The cab is provided with doors in the front and windows at the back and sides. It is lined with teak and has upholstered seats with arm rests and sliding side windows. The regulator and other controls are arranged within easy reach of the driver. The roof of the cab is extended well back over the foot plate and affords every protection to the fireman when shovelling coal.

Other items of equipment are central standard type " D " automatic couplers with American type friction draft gear and two-key attachment, electric head lights and cab lights ; bell with automatic air ringer ; steam heating for the train, asbestos mattresses on the boiler, firebox and cylinders, Westinghouse air brake, cross-compound pump, and a water level indicator on the tender tank.

The following are the principal dimensions :—

Cylinders (2)—	
Diameter	20-in.
Piston stroke	28-in.
Wheels—	
Coupled, diameter	4-ft. 6-in.
Leading truck, diameter	3-ft. 0-in.
Trailing truck, diameter	3-ft. 6-in.
Wheelbase—	
Rigid	15-ft. 0-in.
Total (engine)	31-ft. 10-in.
Boiler working pressure	200 lb. per sq. in.
Heating surface—	
Tubes	1,722 sq. ft.
Arch tubes	23 sq. ft.
Firebox	200 sq. ft.
Total	1,945 sq. ft.
Superheater	443 sq. ft.
	2,388 sq. ft.
Grate area	43.5 sq. ft.

The total weight of engine and tender in working order is 146.29 tons, distributed as shown on the outline drawing. The engine develops a tractive effort, at 85 per cent of the boiler pressure, of 35,259 lb. The tender is carried upon two diamond framed four-wheeled bogies ; it has a fuel capacity of 443 cu. ft. and a water capacity of 5,280 gallons.

The locomotives are intended for service on the Tientsin-Pukow Railway on which maximum grades of 1 in 100 are encountered. The sharpest curve on the main line is 980-ft. radius and of 600-ft. radius in the yards.

The engines are painted black with red lining and present a very well finished appearance, which is enhanced by the copper capped chimneys.

Activities in Manchukuo

As practical measures for the maintenance of law and order in Manchuria have been mapped out, the Manchukuo authorities havedecided to launch the gigantic task of developing various industries in the new State in co-operation with the Japanese.

First, the government has undertaken to complete the webs of communications, building railways and motor-roads to facilitate the development of the countryside and maintain peace and order. As reported, the government has decided to inaugurate the Manchukuo Aero-Transportation Co. to connect Europe and the East by air. Secondly, the authorities plan to establish a communications concern and will undertake to connect Japanese telephone lines with the Chinese lines at Mukden and Changchun. Thirdly, a Japan-Manchukuo concern will be established for the development of the mines of gold, iron and coal. At the same time, the Japanese have definitely decided to open factories for the manufacture of crude oil and sulphate of ammonia and inaugurate the Showa Iron Works. Fourthly, a scheme for the establishment of alminium and magnesium plants is afoot as a Japan-Manchukuo joint concern.

Fifthly, the authorities of the Overseas Affairs Ministry of Tokyo have decided to send the first group of some 500 immigrants to Manchukuo for the agricultural development of the new State, and accordingly, it is optimistically expected that Manchukuo will be turned, in due course of time, into the " land of promise," when the entire land is fully developed.

As to raising funds necessary for these projects the Japanese Military authorities are considering practical measures. It is reported in this connection that the authorities intend to organize a capital pool with funds raised extensively by the Japanese of middle and lower classes in order to avoid control by any group of capitalists.

A Reheating Turbine Installation in Japan*

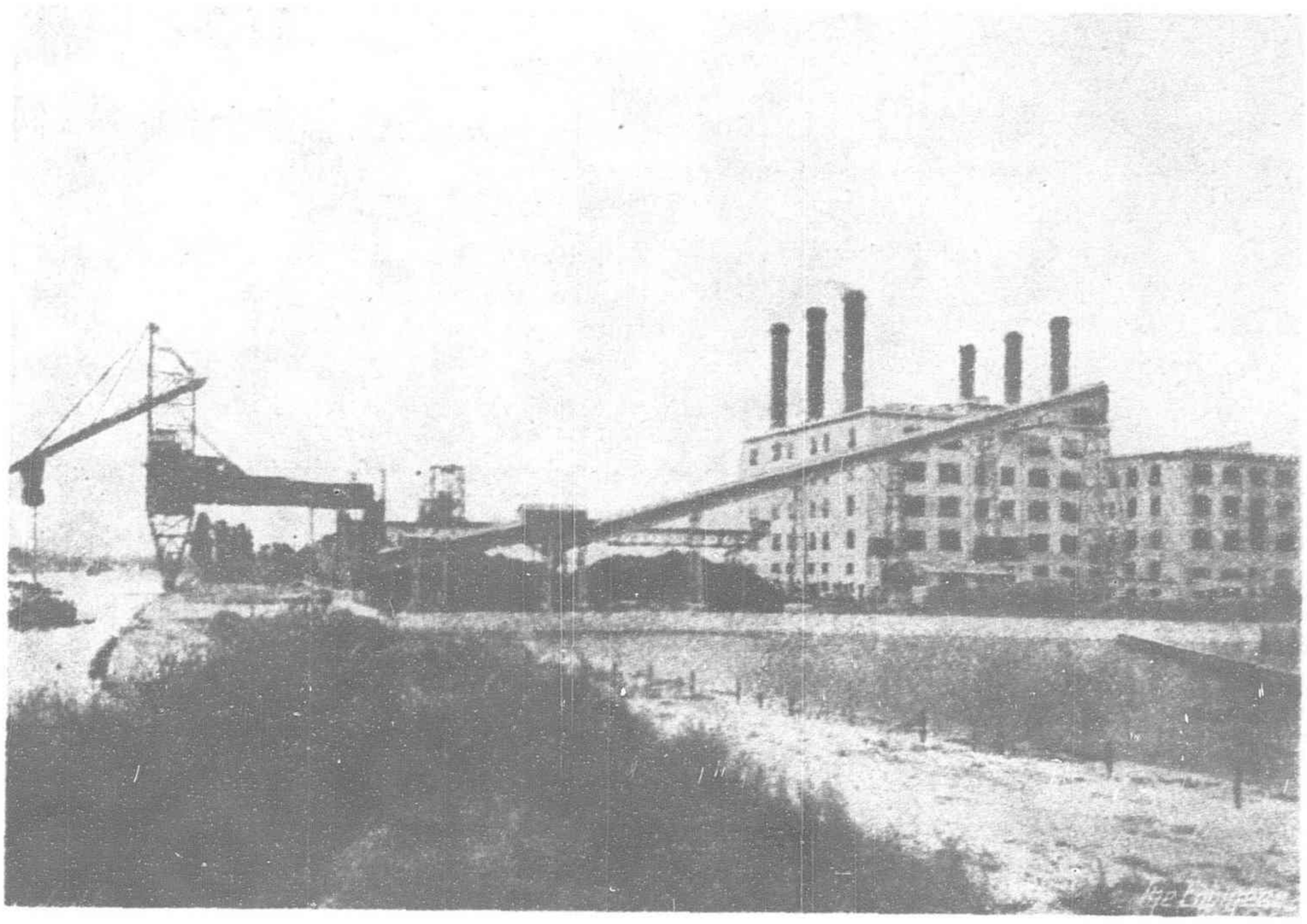


Fig. 1.—Exterior of Station

As early experiences with furnace and gas resuperheaters associated with turbine plant presented difficult temperature control problems, a change has been made in many cases to the more simple method of live steam reheating, which, although less advantageous from a thermodynamic point of view, is amenable to automatic temperature control, and involves less initial outlay. With live steam reheating the gain in efficiency is small and the advantage lies mainly in reduction of the steam wetness in the low-pressure turbine stages with consequent reduction in blade erosion. Reheating in any form has made little headway in America, where the tendency has been to revert to the straight cycle, but it cannot be said that this policy is being adopted universally.

An interesting live steam reheating turbine installation, intended mainly for seasonal duties, has been installed in the Sanyo Chuo Hydro-electric Company's station (Fig. 1) at Shikama, Japan, by the Metropolitan-Vickers Electrical Company, which was responsible for the complete installation, including the two-cylinder turbine, alternator, condenser, feed heaters, evaporators, ejectors, and auxiliary motors. The economic rating of the set shown in Fig. 2 is 28,000 kw. the maximum continuous rating 35,000 kw., and the overload capacity 38,500 kw. The speed is 1,800 r.p.m.

The initial steam conditions are 600 lb./sq. in. g. at a temperature of 725 deg. Fah., reheating being carried out between the cylinders to 480 deg. Fah. The vacuum at maximum continuous rating is 28-in. with a cooling water supply at 80 deg. Fah.

Turbine Construction

As is usual with this class of turbine, the high-pressure cylinder is composed entirely of steel, and consists of a velocity compounded stage followed by nineteen low-velocity impulse stages Accompanying drawings show the general arrangement of the set, a general arrangement plan, a part-general arrangement plan at the turbine end of the set, and the details of the low-pressure spindle gland at the inlet end of the cylinder. The gland—Fig. 3—at the high-pressure end is of the maker's axial clearance type, as developed by them for high steam conditions, the stationary part consisting of two groups of steel segment rings carried in two housings which are backed by flat springs, whilst the corresponding rotating elements are formed from solid steel sleeves secured to the shaft. If rubbing should occur, the resulting local distortion of the parts in contact causes the clearance to be increased and the gland resumes its normal setting when the cause of the rubbing is removed. This labyrinth gland is supplemented by a water-sealed gland, consisting of an impeller rotating in a race supplied with condensate. The vapor from this gland is ultimately returned to the condenser. To maintain the correct axial running clearance for the high-pressure labyrinth gland the Michell thrust block at the high-pressure end is capable of finely adjusting the lateral position of the shaft. At the other end of the high-pressure cylinder the gland is of the comb type, with radial clearances, as shown in Fig. 4. While retaining the correct working clearances, it permits of the expansion of the shaft. It consists of two groups of gland rings, each containing four segment rings, the rings and housings being backed by flat springs. This type of gland also possesses the self-clearing characteristics described above. The built-up diaphragms in the high-pressure cylinder have nozzle blades individually machined from solid bars of nickel steel, and provided at the inner end with a slot which fits over a tongue formed on the steel plate center, to which the blades are securely riveted. Slots are also formed on the outer ends of the blades for the reception of

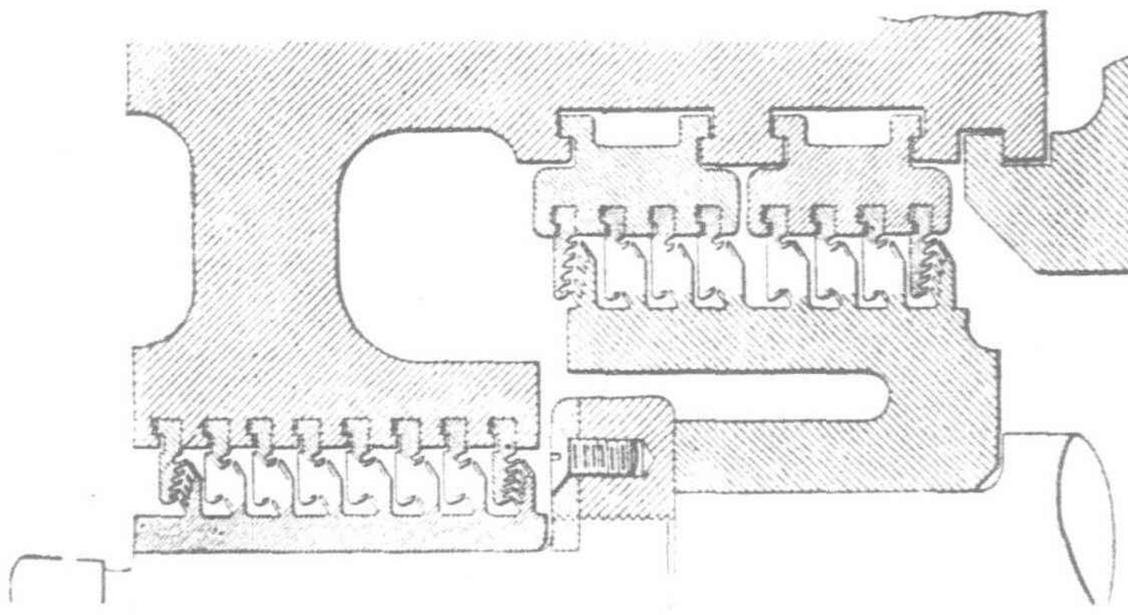


Fig. 3.—High-Pressure Gland

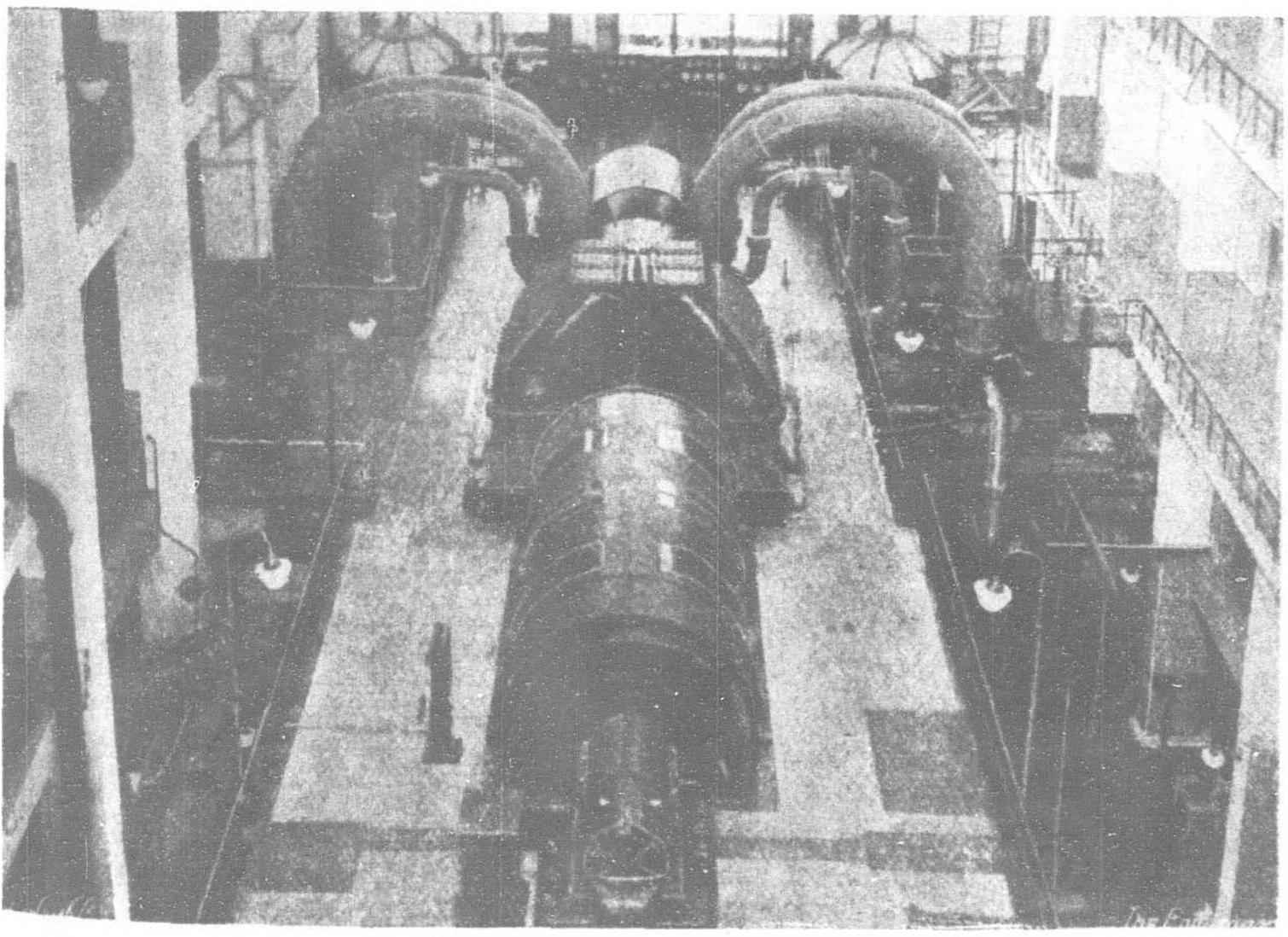
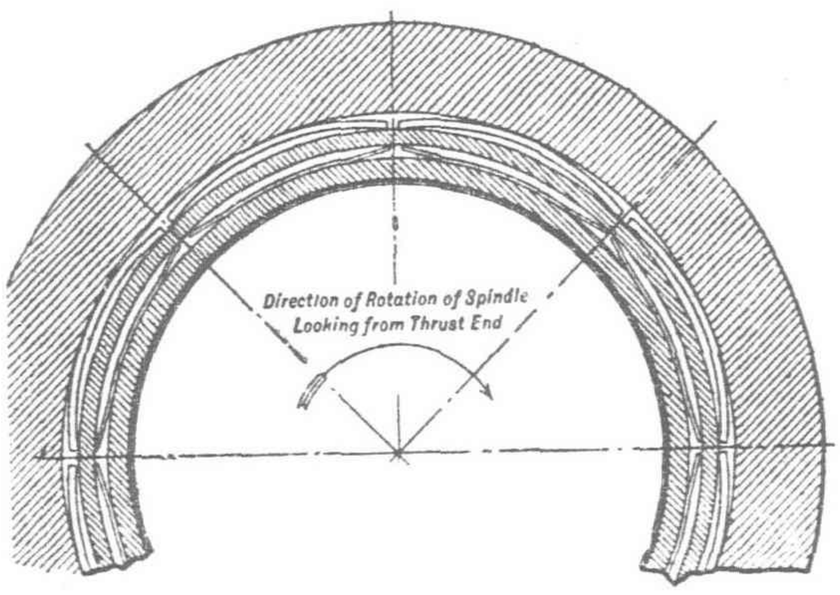


Fig. 2.—Interior of Station

*The Engineer.



ASSEMBLY OF SPRINGS.

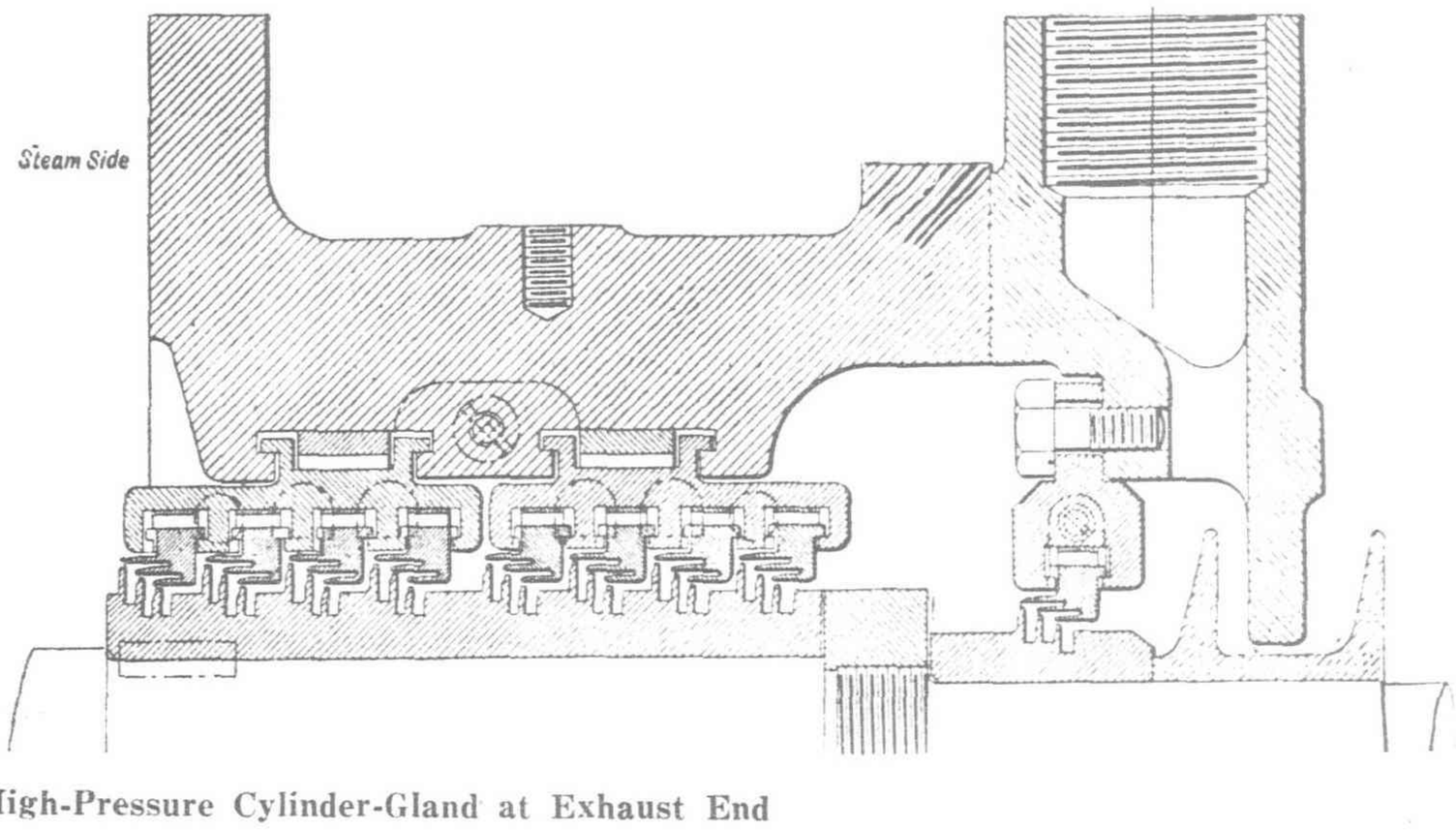


Fig. 4.—High-Pressure Cylinder-Gland at Exhaust End

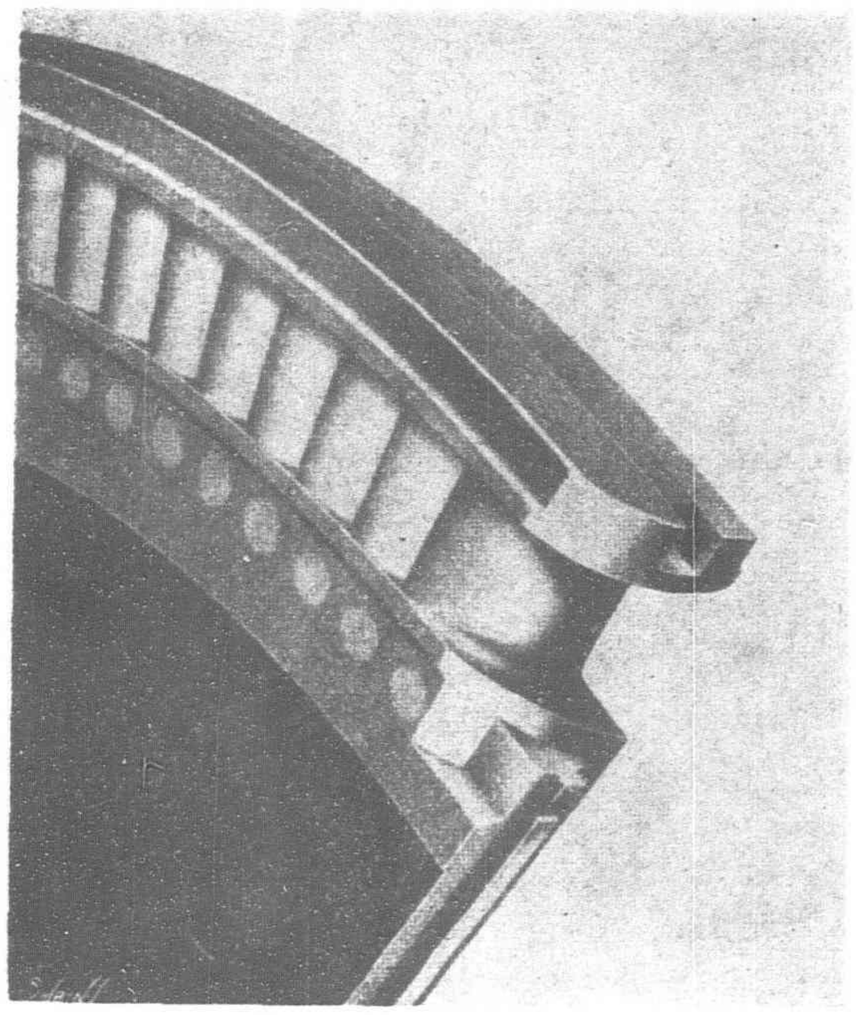


Fig. 5.—Part of Diaphragm

gland consists of a segment ring similar to those comprising the gland at the low-pressure end of the cylinder. The rotating blades—Fig. 6—are composed of rolled section stainless steel. They have "T" shaped roots, and register with corresponding grooves formed in the wheel peripheries, the blades being interspaced by means of packing pieces.

double comb radial clearance type, arranged in four groups of four segment rings. In construction this gland is similar to that at the low-pressure end of the high-pressure cylinder, but as the proximity of the low-pressure spindle thrust block obviates the necessity to cater for axial expansion, double-sided segments can be employed. At the low-pressure end of this cylinder the gland is of the water-sealed type.

Main Governor Valves

On the steam chest there are two automatically controlled governor valves. One of them supplies steam to the velocity stage nozzles and deals with loads up to 28,000 kw., whilst the other by-passes the velocity stage and the first four impulse stages, and deals with loads up to 38,500 kw., even when the reheater is out of commission. This corresponds to a volume of steam considerably in excess of the volume at normal load, and in order to improve the consumption between 28,000 kw. and 36,000 kw. a hand-operated valve is provided to enable the velocity stage to be by-passed alone, thus admitting steam from the first governor valve direct to the first impulse stage inlet nozzles. The high and low-pressure spindles are coupled by means of a Bibby type flexible coupling, while those of the low-pressure turbine and alternator are coupled by means of a semi-flexible coupling consisting of a steel shell which is flexible in bending but rigid in torsion and is rigidly bolted at its ends to the respective shafts.

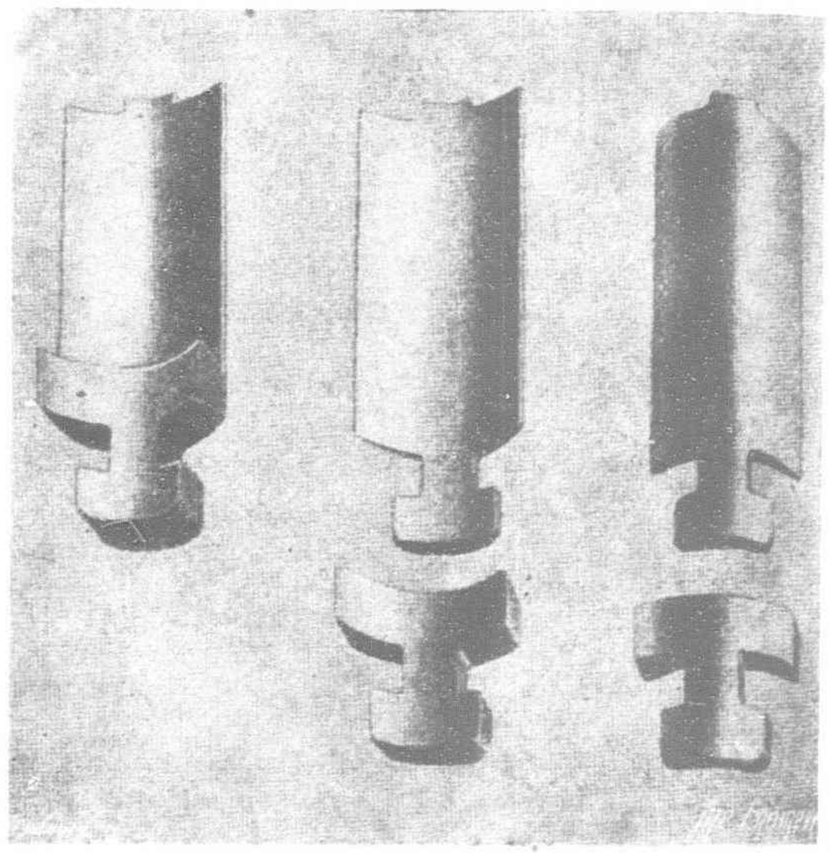


Fig. 6.—Moving Blades

Low-Pressure Cylinder

The low-pressure cylinder of the turbine consists of eleven impulse stages followed by a Metropolitan-Vickers duplex multi-exhaust. Extending to the first six stages the high-pressure portion of this cylinder is composed of steel, whilst the remainder is cast iron. The first three diaphragms in the cylinder are built up, the remainder being of cast iron with cast-in steel blades. The first six rows of rotating blades are composed of stainless steel, and are similar to those in the high-pressure cylinder, whilst the remaining moving blades are of the straddle root type, and are made of 5 per cent nickel steel. At the inlet end of this cylinder, circumferential key strips. When completed, the diaphragms fit into grooves turned in the cylinder casing. A portion of a diaphragm showing the method of assembly is illustrated in Fig. 5. The method adopted is claimed to possess advantages of very high accuracy, which is contributory to high efficiency, and of rigid and robust construction. At the inner periphery of each diaphragm the gland—Fig. 7 and drawing—is of the

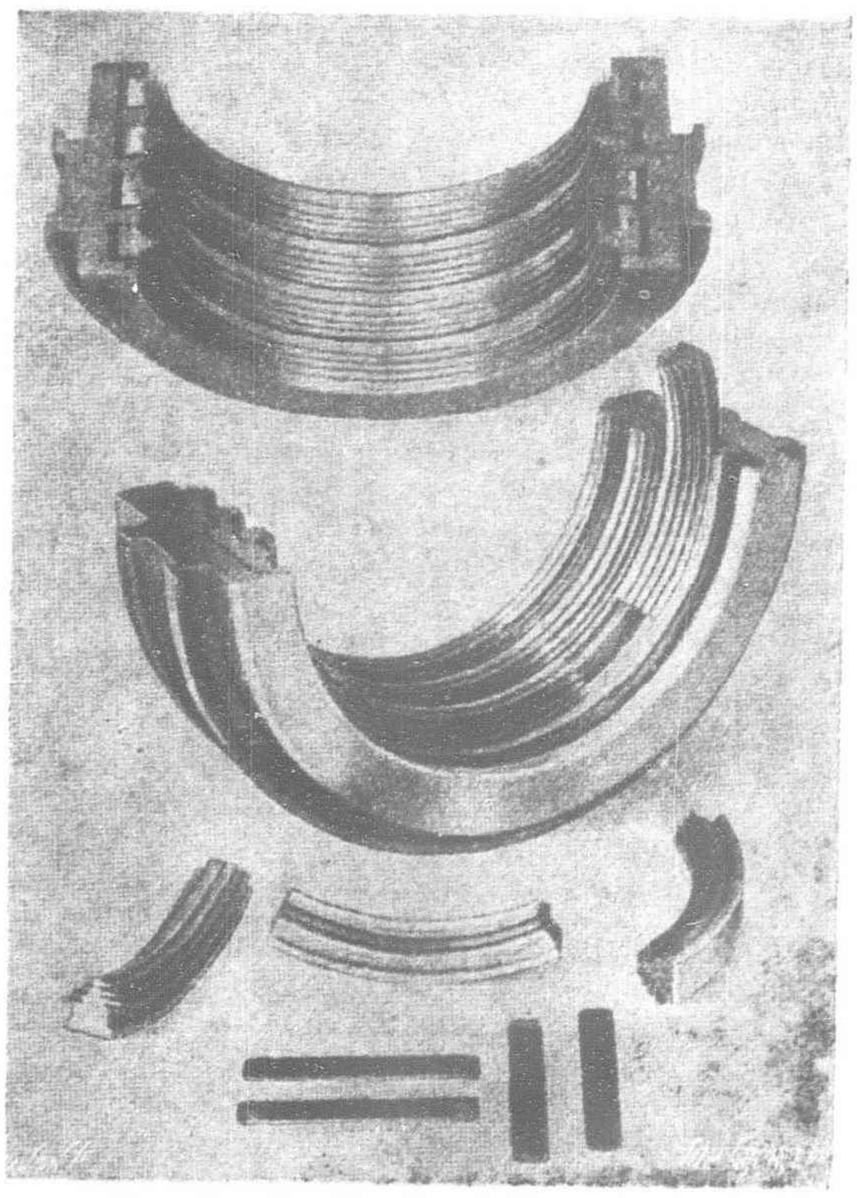
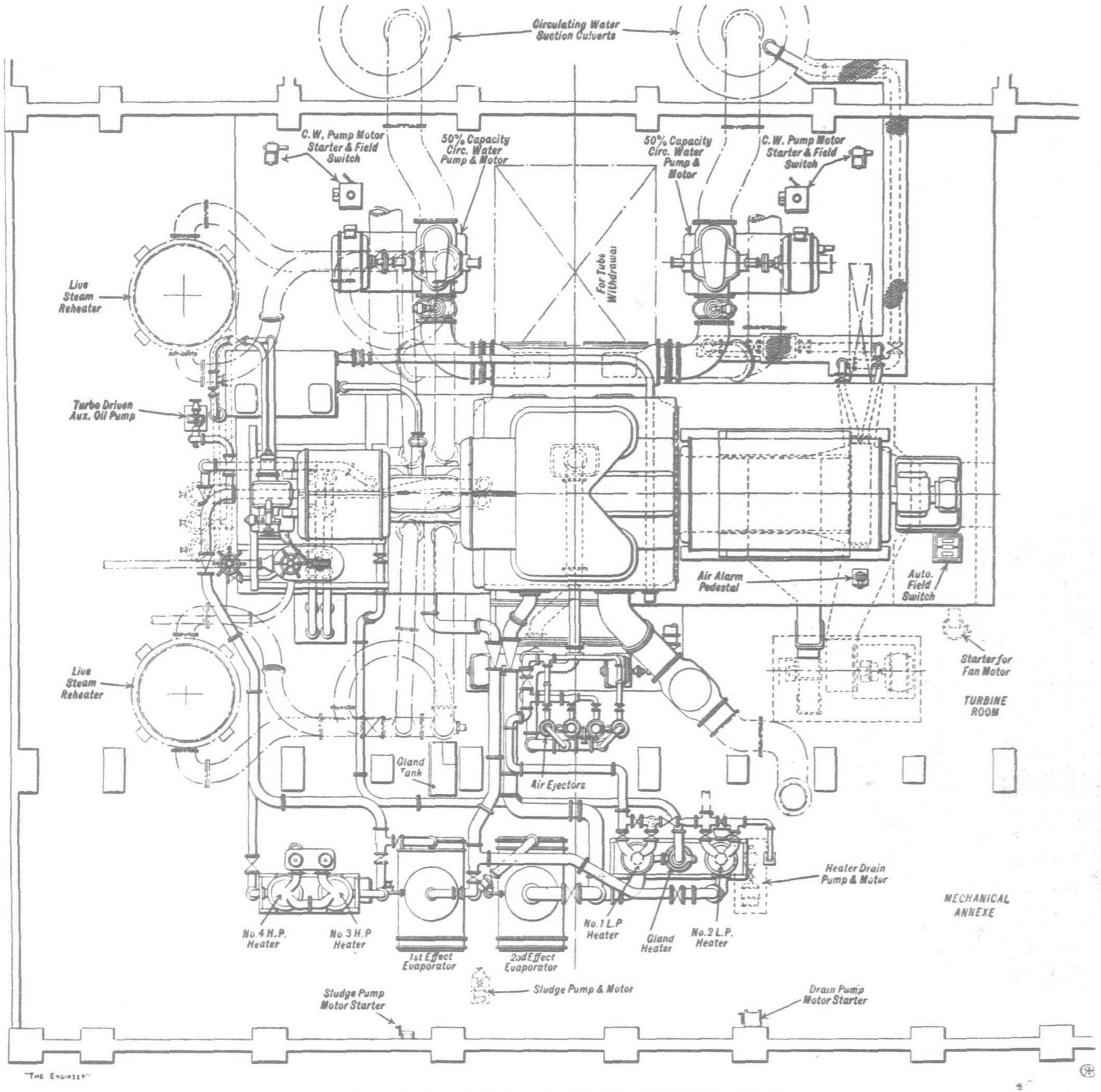


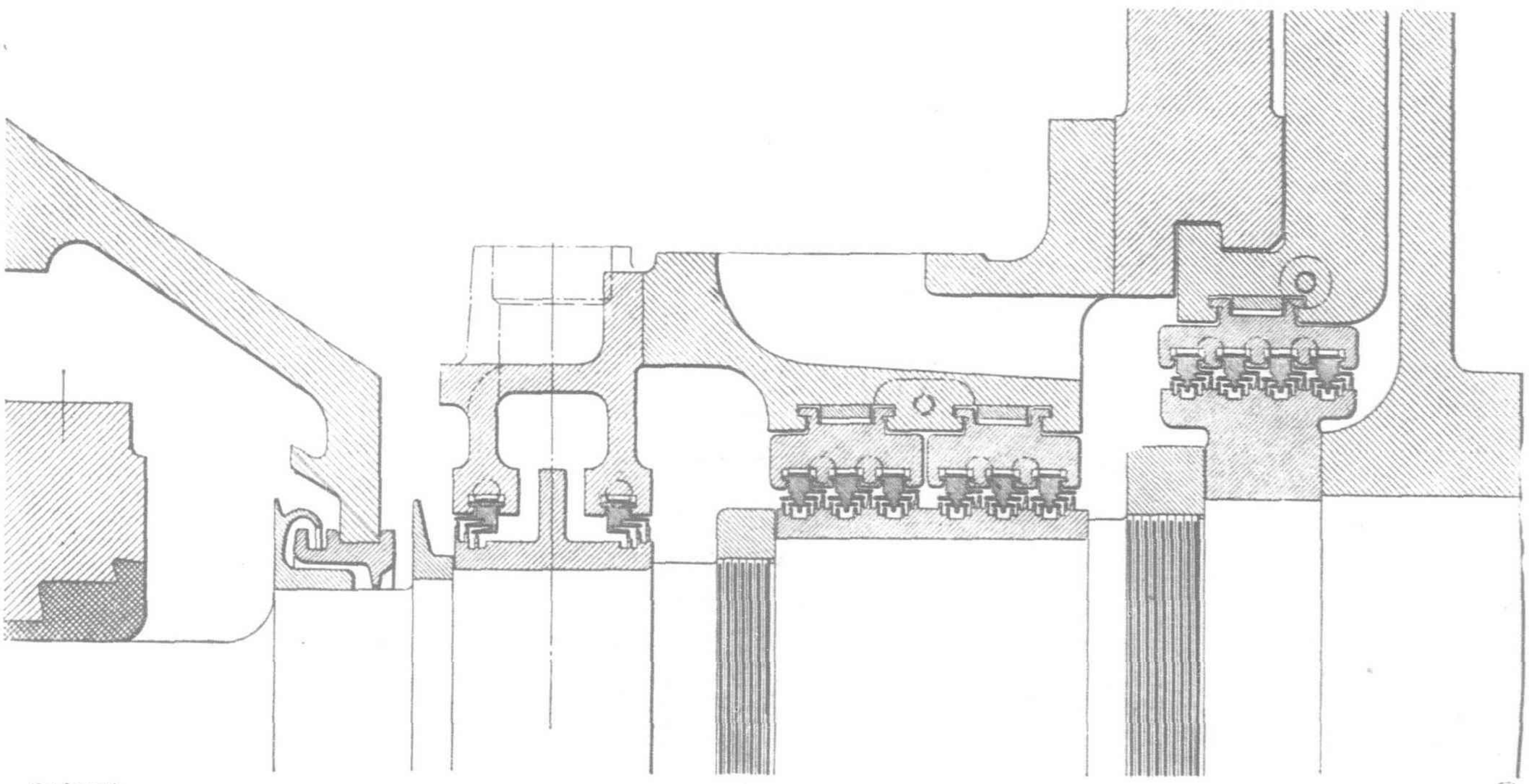
Fig. 7.—Double Comb Type Gland

Condenser and Auxiliaries

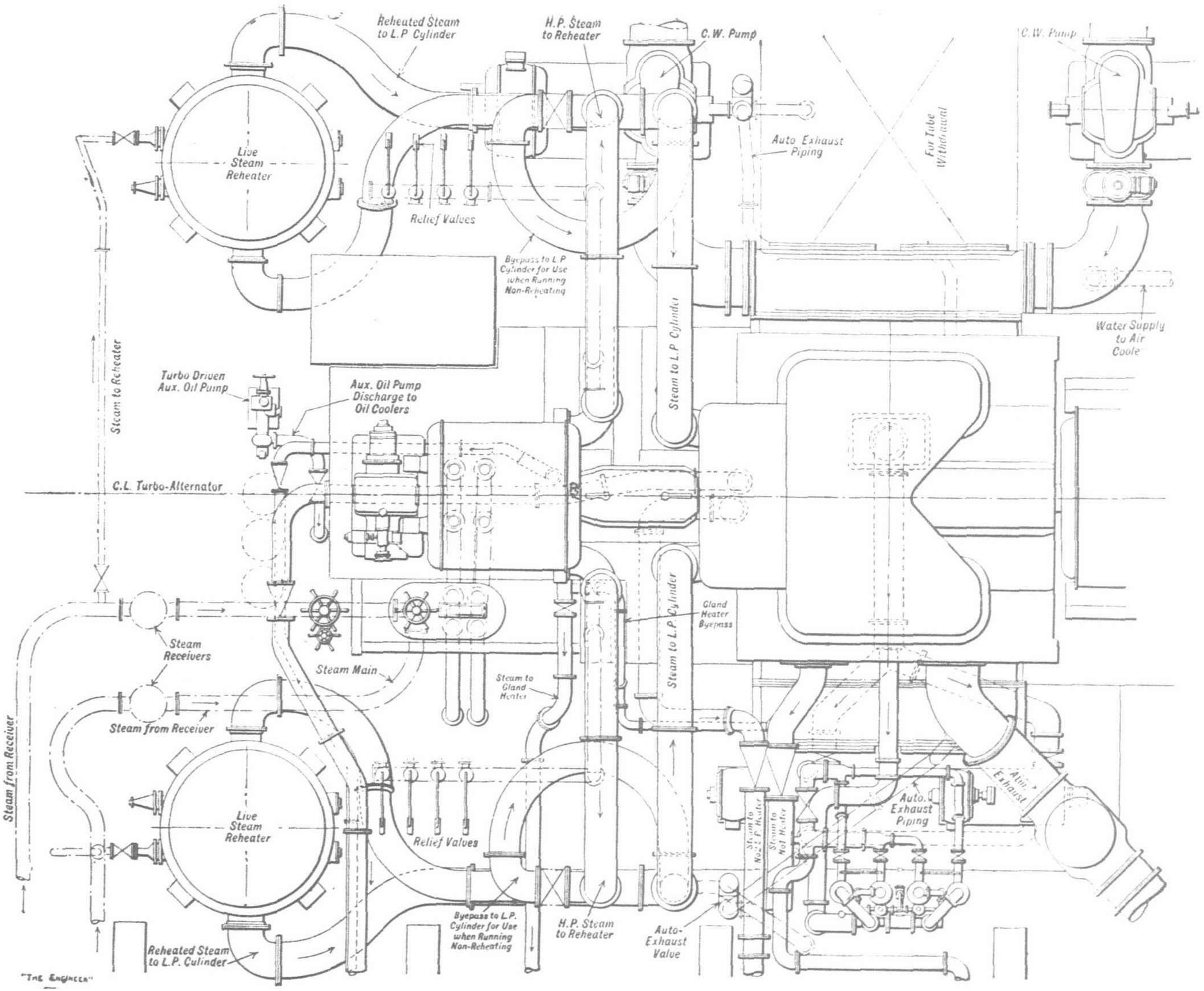
With a cooling surface of 50,000 square feet, the Metropolitan-Vickers



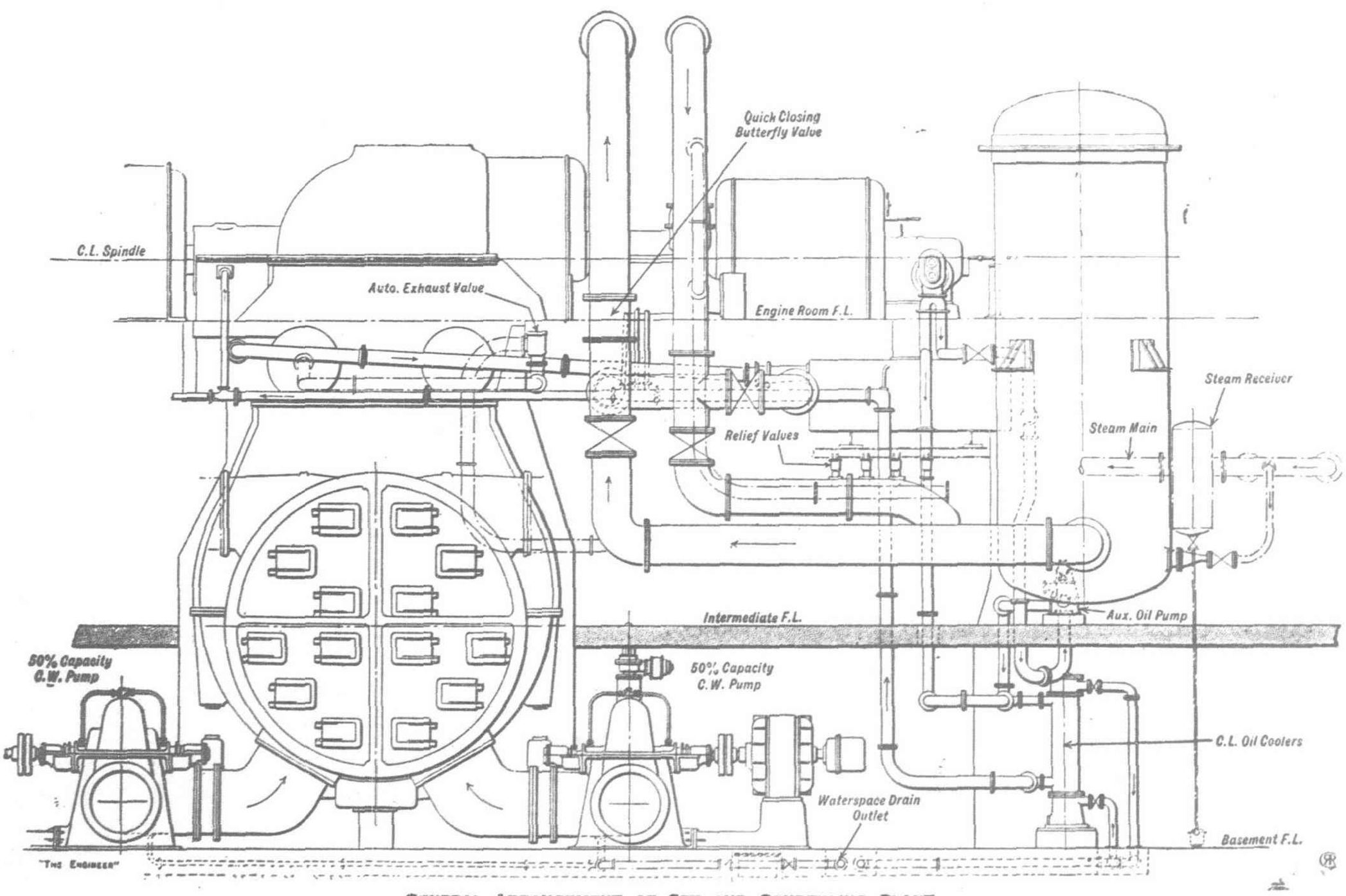
PLAN OF TURBO-ALTERNATOR SET AND CONDENSING PLANT



LOW-PRESSURE SPINDLE GLAND AT INLET END



1. PART GENERAL ARRANGEMENT PLAN OF TURBO-GENERATOR SET



GENERAL ARRANGEMENT OF SET AND CONDENSING PLANT

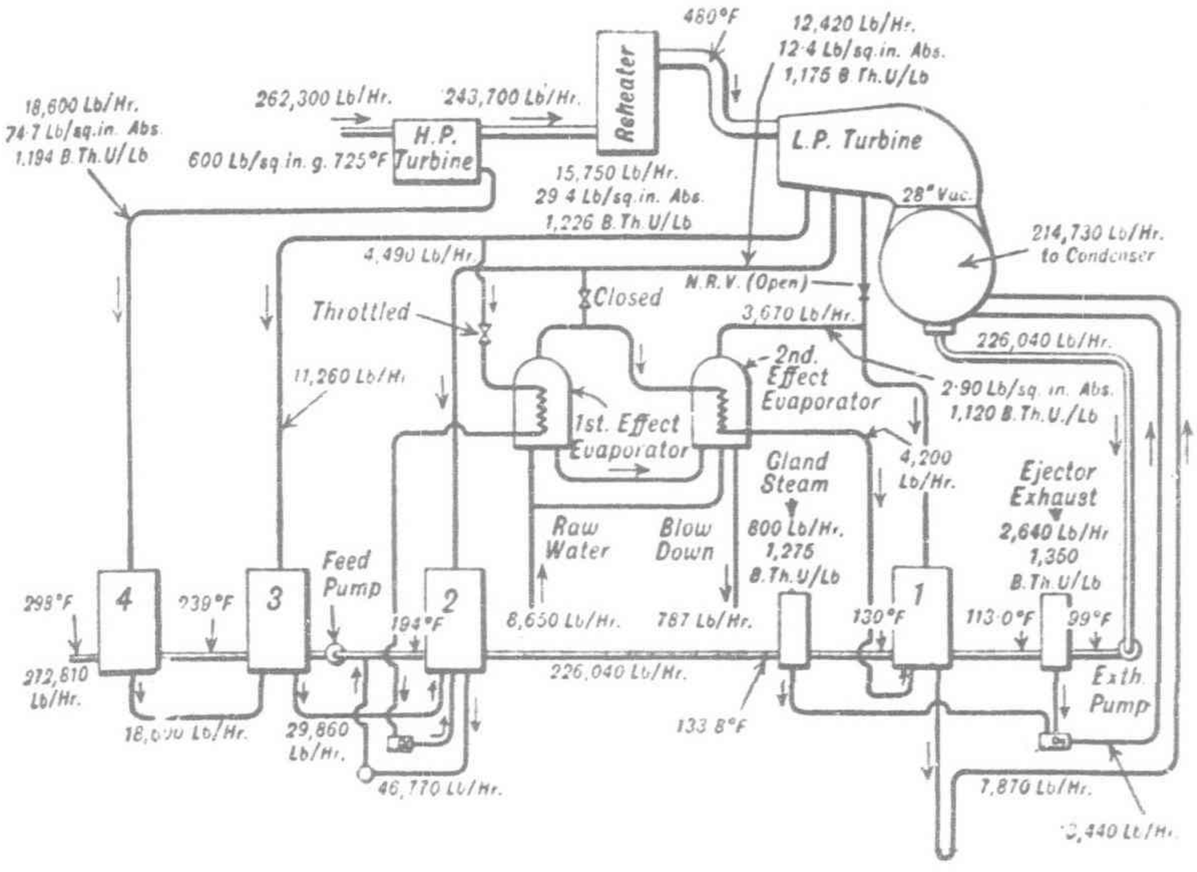


Fig. 8.—Economical Load Heat Balance Diagram

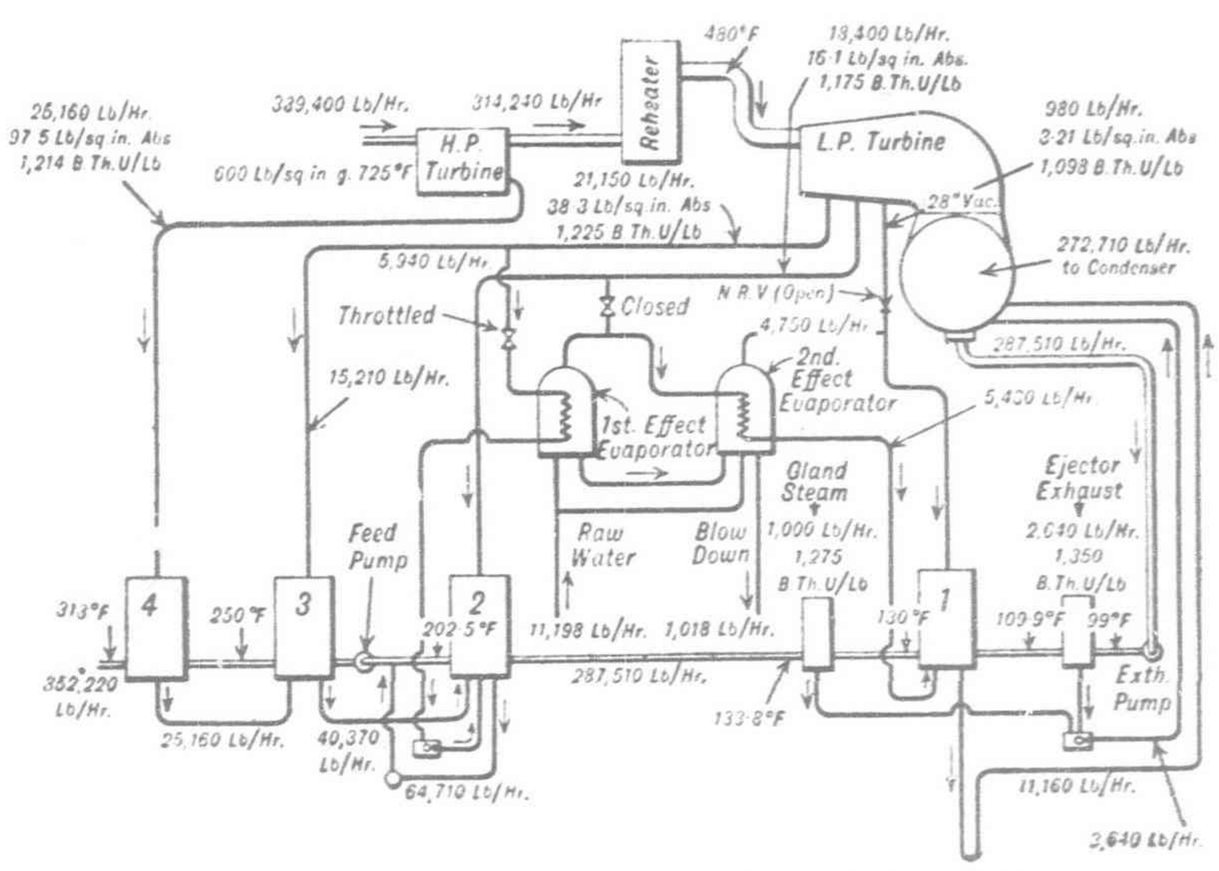


Fig. 9.—Maximum Continuous Load Heat Balance Diagram

central flow condenser is one of the largest units manufactured in England. The cast iron shell is built up in sections, which are bolted together, and the water-box and end covers are also of cast iron. There are 9,710 tubes of 18 S.W.G. thickness, and with an outside diameter of 1-in. Sea water at a temperature of 80 deg. Fah. will be used for cooling. The condenser is bolted directly to the turbine exhaust flange and spring supports are provided underfoot on the shell. All the condensate and the make up from the evaporators is deaerated in the condenser itself, thus avoiding the use of separate deaerating plant.

There are two Drysdale motor-driven circulating pumps, each designed for 50 per cent of the full required capacity, and two Drysdale motor-driven extraction pumps, each capable of performing the full duty independently. After leaving the extraction pumps, the condensate is passed through the coolers of a two-stage Metrovick ejector, in which the latent heat of the ejector operating steam is recovered, and added to the condensate. There are two of these ejectors, and each is capable of the full capacity required. From the coolers of the ejectors the condensate passes to two Metrovick low-pressure and two high-pressure heaters, and also to a gland cooler between the two former heaters for the recovery of the heat of the gland leakage steam. The feed enters the vertical heaters at the top of a divided water-box, and then passes through U tubes and returns to another section of the water-box from which in the case of the four-flow low-pressure heaters, it passes to the next "flow," the high pressure pressure heaters being of the two-flow type.

The main heaters are supplied with steam tapped from the low-pressure cylinder inlet, after the third, sixth and tenth stages of this cylinder, and the condensate from the third and fourth heaters is cascaded back to the second heater, from which it is delivered by a drain pump into the feed line on the suction side of the boiler feed pump, the condensate from the first heater being passed back to the condenser. The low-pressure heater bodies are made of cast iron, whilst those of the high-pressure heaters are composed of riveted steel plate. In order to isolate the high-pressure heaters from the feed circuit, in the event of the condensate level exceeding a predetermined limit, suitable automatic devices have been provided for the purpose, and the possibility of the turbine being flooded from the steam side of the heaters is thus avoided. In the feed system between the first and third heaters, Metrovick double-effect, low-pressure, straight-tube evaporators have been incorporated, and the make-up from both units is collected in the first heater, from which it is passed back to the condenser where it is completely deaerated before removal by the extraction pump.

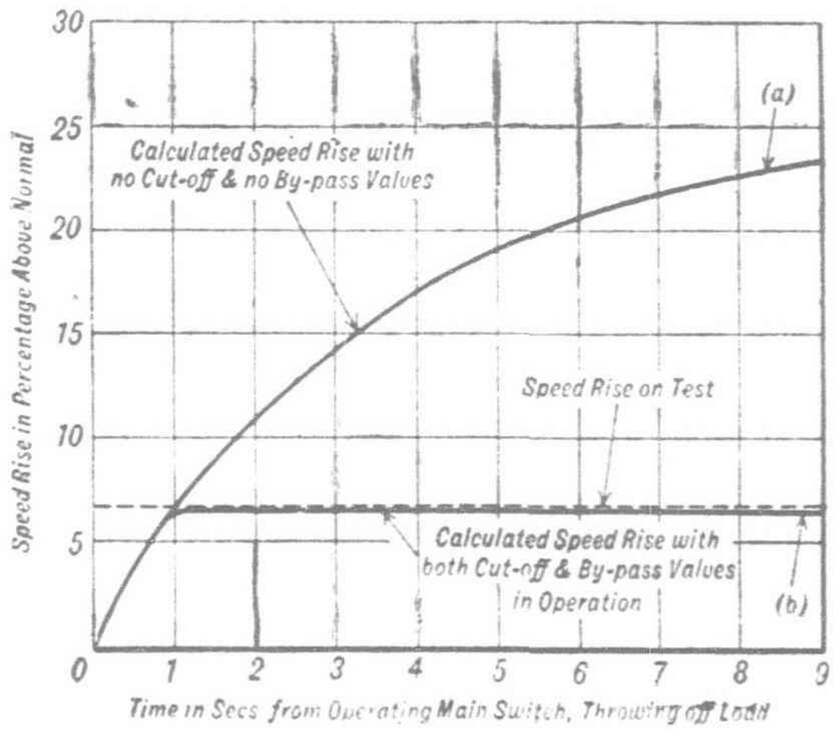


Fig. 10.—Time-Speed Curve

The evaporator shell is formed of welded steel, and an important feature of the design is that, apart from a short length at each end, the tubes are oval, a feature which is claimed to facilitate the quick release of the vapor generated and to reduce turbulence at the surface of the make-up water. Packed ferrules are provided at each end of the copper tubes, and those at one end are designed to permit of the easy withdrawal of the tubes. Above the normal make-up level there is a single row of tubes which constitute a "hot plate," or drying tubes, for evaporating the make-up in suspension, whilst, in order to remove any residue of suspended make-up, the domes of the evaporators are provided with a system of separator baffles.

Reheaters

Live steam reheaters, which were made in Japan, are arranged on opposite sides of the high-pressure cylinder, as shown in one of the plans. Each of the two vertical shells of the two evaporators is 26-ft. 6-in. long and 8-ft. 3-in. in diameter; the high-pressure steam tubes have an outside diameter of $1\frac{1}{2}$-in. and are 0.144-in. thick. The low-pressure steam enters at the base, and after passing upwards across the high-pressure coils, returns to the outlet at the other side of the base behind a vertical baffle plate. The piping was made by Aiton & Co., Ltd., of Derby. In designing the pipe connections to and from the reheaters care was taken to provide ample

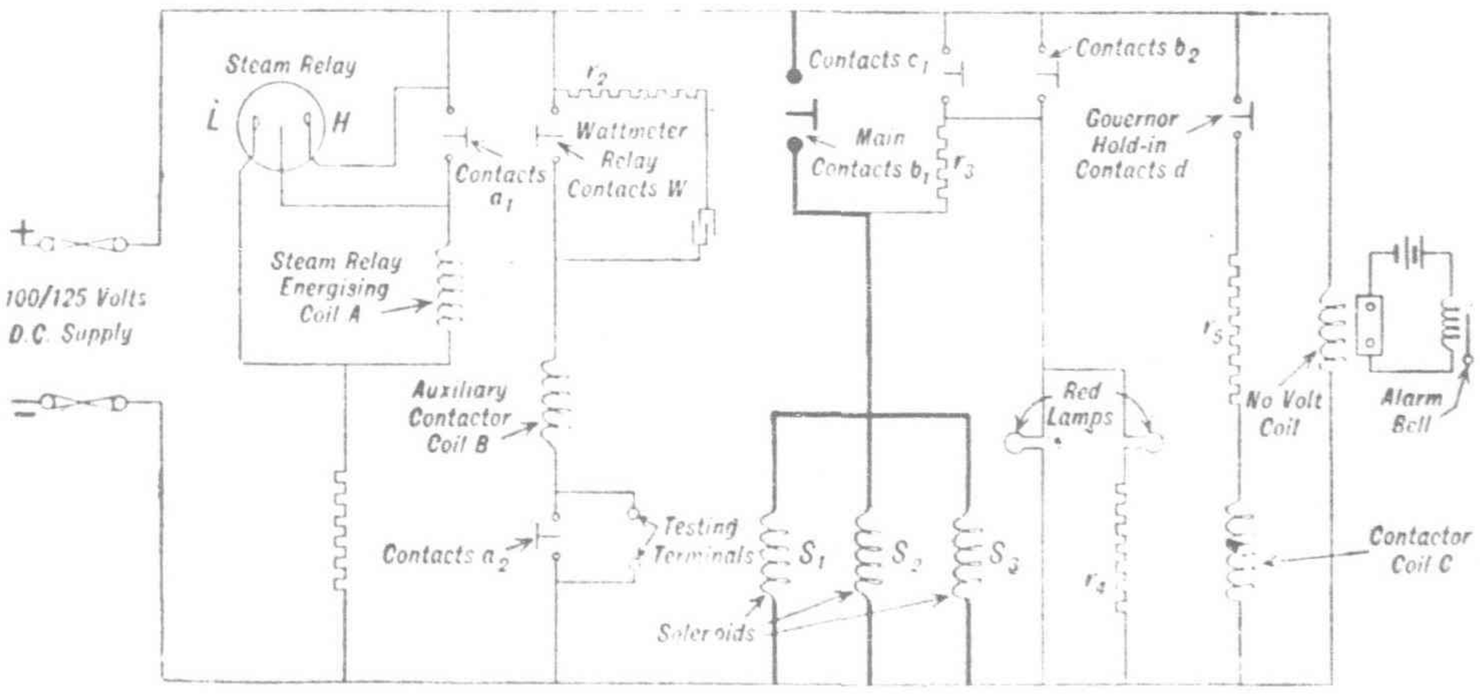


Fig. 12.—Electrical Connections for Control Gear

flexibility and to reduce the length of the low-pressure piping to a minimum.

Operation of Reheater Gear

In two-cylinder reheating turbines, with the reheater between the cylinders, the large volume of steam contained in the reheater and pipe connections is beyond the control of the governor valve, and in the event of a sudden drop in load the pressure of this steam may be sufficient to speed up the turbine to an undesirable extent during its passage through the low-pressure cylinder to the condenser. The protective system which has been adopted in the case under consideration was evolved by the Metropolitan-Vickers Electrical Company. In the event of the load falling below a predetermined amount in advance of the drop in pressure in the reheater connection, the reheater is automatically isolated from the low-pressure cylinder, and the steam in the reheater is by-passed directly to the condenser. Simultaneously, the closing action of the main governor valve is automatically accelerated. After a suitable time interval, during which the pressure in the reheater has had time to drop to a safe value, the system automatically resets itself and permits the main governor valve to reopen and the steam to follow its normal path. The by-pass mechanism operates when the following conditions are fulfilled :—(*a*) When the load on the alternator drops below approximately 6,000 kw. and (*b*) when the steam pressure at the inlet to the low-pressure cylinder is too high for that load, i.e., at or above 13 lb. per square inch gauge, this pressure corresponding to a load of 90,000 kw. and giving an overlap of 3,000 kw. Hence, it will be seen that the system provides protection against overspeed arising from any sudden decrease of load, but it is inoperative in the event of a gradual decrease of load which will lower the intermediate steam pressure.

Main and Reheater Governor Systems

The action of the main and reheater governor systems will be understood from the diagrammatic arrangements, Figs. 12 and 13. Considering first the electrical connections shown in Fig. 12, if the load on the machine falls below 6,000 kw. the contacts W of the wattmeter relay close, and if at the same time the steam pressure at the steam inlet to the low-pressure cylinder is 13 lb., or over, the contact H of the steam relay completes the circuit through the steam relay energizing coil A, thus causing the contacts a_1 in the steam relay circuit, and a_2 in the wattmeter relay circuit to close. Current thus flows through the auxiliary contactor coil B, which actuates the main contacts b_1, and permits the flow of energizing current to the operating solenoids S_1, S_2 and S_3. When the pressure at the point in question falls below 13 lb. gauge, the steam relay contacts open, but as the circuit through the coil A and contactor a_1 is not broken, the solenoids remain energized. But when the pressure falls to 9 lb., the alternative contacts L in the steam relay close, and, in short circuiting the coil A, open contacts a_1 and a_2, which de-energizes the solenoids.

The solenoids are energized when the load is below 6,000 kw. and the steam pressure is 13 lb. gauge or over, and become de-energized when the pressure falls below 9 lb. gauge. In order to prevent the solenoids becoming de-energized if the machine is running above normal speed, contacts *d* mounted on the main

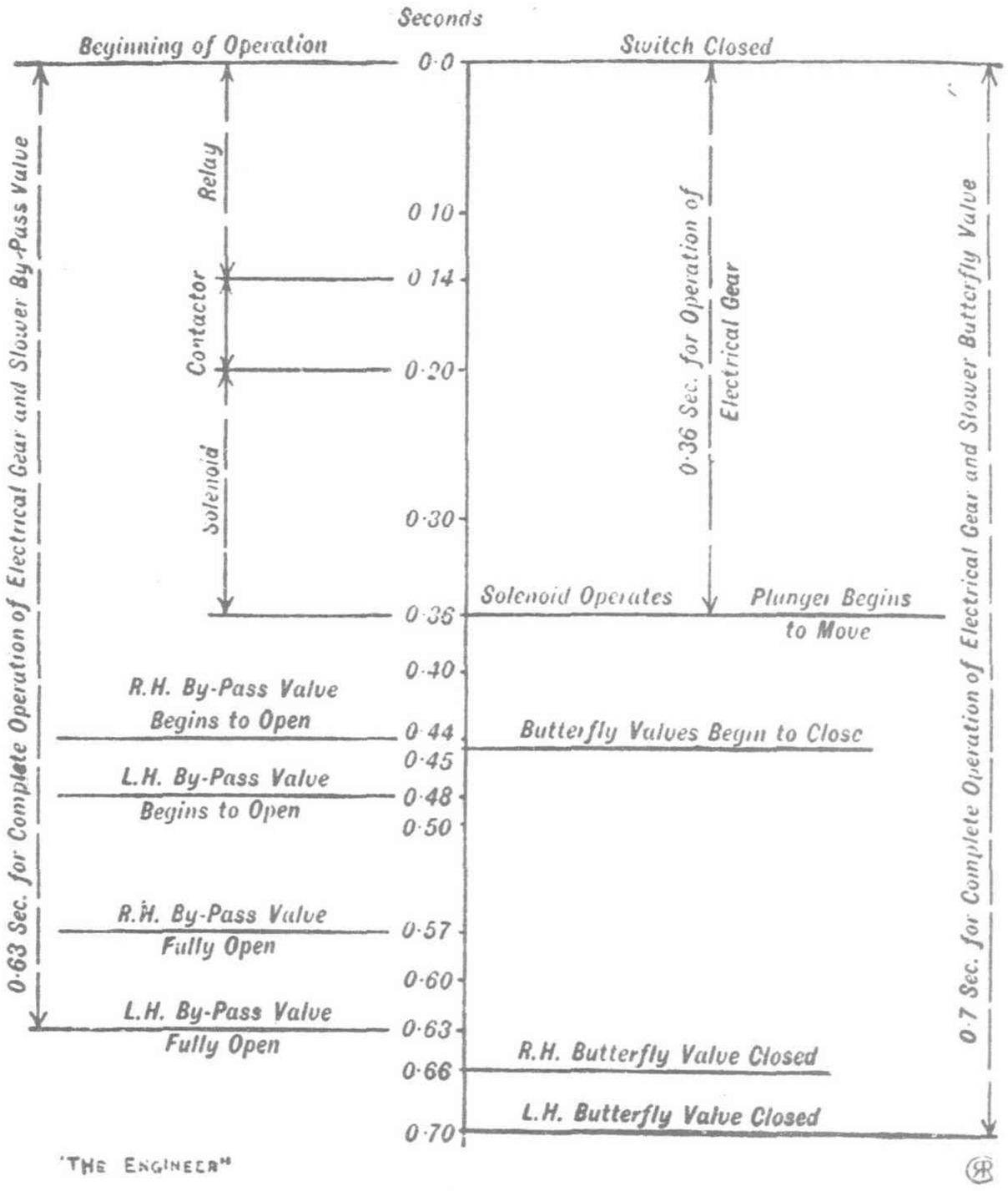


Fig. 11.—Time Interval Chart

governor, complete a circuit through coil C, which, in turn, closes contacts c_1, and allows a current limited by resistance r_3 to continue to flow through the solenoids. This current is sufficient to maintain them in their raised position, but insufficient to operate them if the main contacts b_1 are opened, and only the governor arm contacts *d* are closed.

Red signal lamps brought into circuit by the energizing of contactor coil B and the closing of contacts b_2 are fitted on the main control board to notify the attendant of the operation of the gear.

Coming now to the mechanical portion of the gear—Fig. 13—during normal operation of the machine, the steam valve F is maintained in the open position by oil pressure acting below the piston in the cylinder G. Similarly, the valve J is normally maintained in the closed position by a piston in the cylinder K, the oil to both cylinders being supplied from the oil pump, and is controlled by the pilot valve M. In the event of a sudden fall in load beyond the predetermined limit, with a corresponding excess of pressure in the reheater, the operation of the wattmeter relay and pressure relay described causes the solenoids S_2 and S_3, Fig. 12, to become energized. As two reheaters are employed—one on each side of the turbine—the whole of the by-pass gear is duplicated, solenoid S_2 operating the gear shown, and solenoid S_3 operating similar gear on the opposite side of the plant. The movement of the armature in S_2 raises the valve M, and by connecting the underside of the power pistons in cylinders G and K to a drain, allows the plungers to fall under spring action and so to close the valve F, at the same time opening the by-pass valve J.

It is, of course, essential that the closing and opening of the valves F and J respectively be carried out with great rapidity, otherwise the whole purpose of the gear is nullified. Hence, a special rapid release valve H is fitted to the cylinders G and K, and to the corresponding valves on the other side of the plant.

The oil admitted under pressure through the medium of the pilot valve M is led below a piston housed in the valve H and raises it against spring tension until ports are brought into alignment,

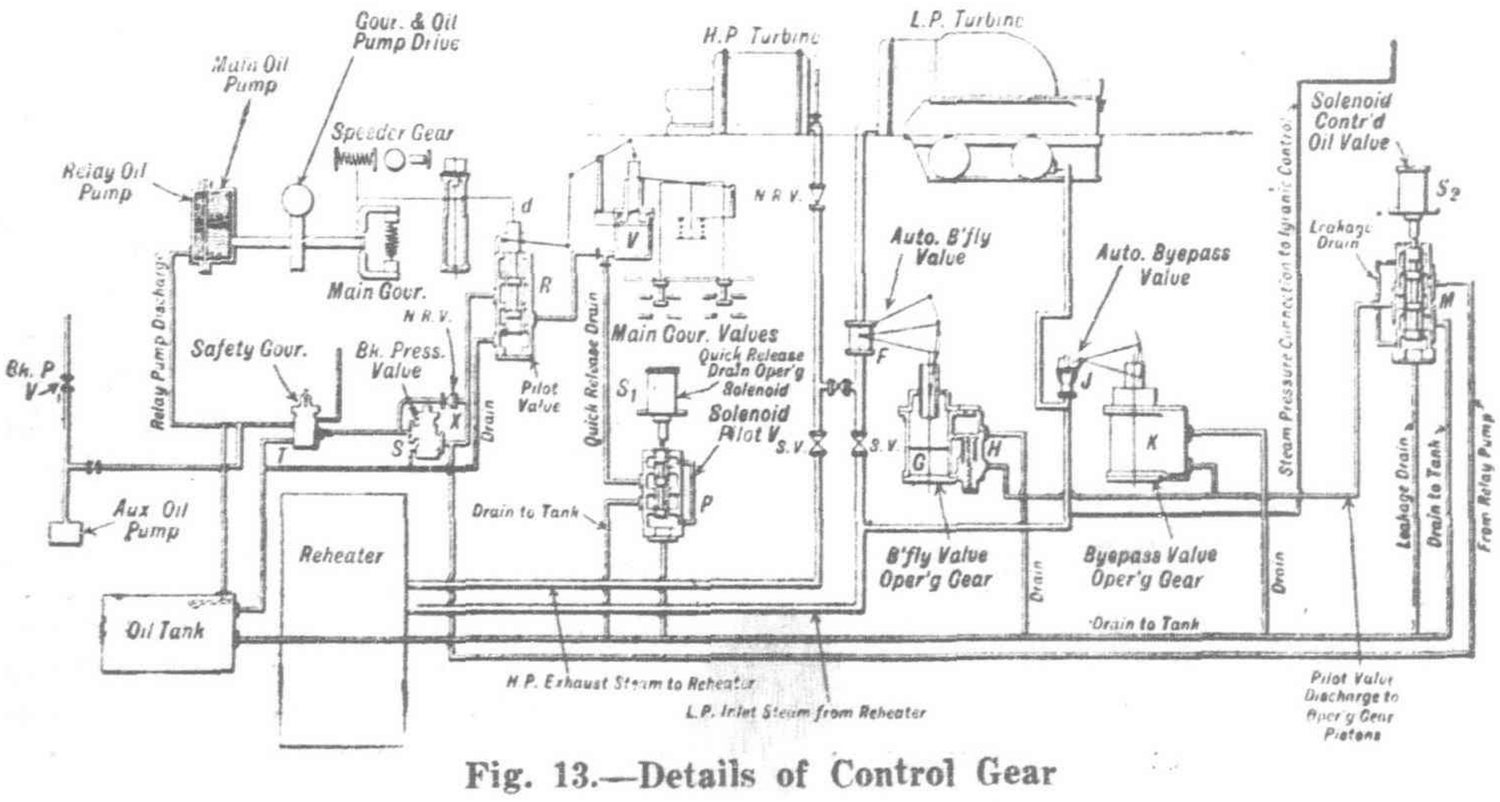


Fig. 13.—Details of Control Gear

and so allows the oil to enter the cylinder G. The piston is thus maintained in its raised position during normal operation of the plant. The release of the pressure by the piston valve M causes the piston in the valve H to fall and so connect the underside of the power piston G to an oil-discharge space situated immediately above the valve H, and into this space the oil is rapidly passed by the spring acting on the power piston. The oil discharge is then much more rapid than if it took place through lengthy oil drain piping. Simultaneously with the operation of the gear following that of S_2 and S_3, the solenoid S_1 raises the valve of the pilot P and releases the oil pressure below the main steam governor power valve V, thus causing it to close rapidly.

It is necessary, however, to prevent this drop in oil pressure extending to the overspeed governor trip valve, for otherwise the latter would operate and shut down the plant. In the absence of proper arrangements this action would be possible on account of the sympathetic upward movement of the main governor pilot valve as the main governor valve falls. To prevent this trouble arising, however, a sensitive back-pressure valve S—Fig. 13—is incorporated and closes immediately the pressure drops below that of the relay oil pump, thus isolating the latter from the reheater relay gear.

In the event of overspeed sufficient to cause the overspeed governor to operate and so actuate the oil trip valve T, it becomes necessary to ensure that the back-pressure valve S does not maintain the pressure below the governor valve power piston, and for this purpose a non-return valve X is included in the system to allow oil to by-pass the valve S and so close the main governor valves. In the event of a failure on the auxiliary electrical supply the operation of a no-volt relay brings an alarm bell into operation and thus gives the attendant audible warning. Testing terminals enable the operation of the gear to be checked at light loads, and the closing of the circuit at a load sufficient to close the wattmeter relay completes the circuit through the auxiliary contactor coil B, thus closing the contacts b_1 and energizing the solenoids.

The curve *a*, Fig. 10, shows the calculated speed rise with a load of 35,000 kw. suddenly thrown off, while the lower curve *b* shows the calculated speed rise with the cut-off governor mechanism in operation and based on 0.7 second for the time of operation of the gear. The dotted line indicates the actual speed rise obtained on a test on site with the same load thrown off. The actual time taken for this maximum speed rise was not measured, but it will be seen that the maximum rise in speed with a load of 35,000 kw. thrown off was 6.7 per cent.

The details of the time intervals of the operations involved in the functioning of the various parts is shown in Fig. 11, which represents the result of a test carried out on the gear at the manufacturers' works. The actual site conditions were reproduced in every detail, and in arranging the oil piping care was taken to use the same pipe lengths and the same bends as those required at the station. It will be seen that the time taken from the closing of the switch corresponding to the wattmeter relay contacts, to the complete closing of the last butterfly valve was 0.7 seconds. As the gear was designed to operate over a voltage range of 100 to 125-volts, it was decided to test it at the minimum value, as this would give a result under the worst conditions, the rapidity of operation of the gear naturally tending to increase with a high voltage. Actually the works tests were carried out at 99-volts and the results obtained were those shown. Heat balance diagrams for economical and maximum continuous loads are given in Figs. 8 and 9.

Alternator

The 28,000 kw., three-phase, 60-cycle, 11,000-volt, 1,800 r.p.m. alternator has a fabricated steel case and a concentric type stator winding, the conductors being of the Metropolitan-Vickers transposed type, giving free thermal expansion. A solid steel forging weighing 45 tons constitutes the rotor, which was subjected to special tests to ensure uniform soundness of the material. The method employed in the Metropolitan-Vickers works when making this test consists in creating a magnetic field tangential to the surface under inspection and then washing the surface with paraffin in which finely divided iron powder is suspended. The adherence of the powder to the edge of even a minute crack makes the latter easily visible. The method is applied to the rotor surface and to the bore, a specially designed periscope being employed in the latter case. An efficient system of ventilation in which the air is admitted into special slots arranged below the winding slots and in which a large number of holes drilled radially in the rotor teeth communicate with the longitudinal fan slots, ensures that there is no undue heating.

The overhung exciter has a radial commutator, and to meet the specified high degree of stability, stability plates of cobalt steel have been incorporated in the magnetic circuit. The alternator is ventilated in accordance with the makers' closed circuit system. Fans mounted on the ends of the rotor deal with 40,000 cubic feet of air per minute, while a separate motor-driven fan deals with a further 40,000 cubic feet per minute. The two Metrovick coolers consist of cast iron water boxes with banks of finned brass tubes between them with a total cooling surface of 13,750 square feet.

City Planning in Manchukuo

In anticipation of the rapid growth of the local population in the near future, the Manchukuo authorities are now drawing up a huge city planning scheme in order to make the capital of Manchukuo capable of accommodating at least 1,500,000 people.

Side by side with the steady growth of the town, the imminent removal of various official buildings from Mukden to Sinking has virtually created a building boom in the town. With various large scale construction schemes in progress, both contractors and building workers are enjoying an unusual trade boom.

Due to insufficiency of labor and to lack of adequate supply of building materials, the wages and the price of materials are steadily mounting with resultant lively business activities in the rest of the trades. The phenomenon is regarded as something unusual at this time of world wide depression and the general tendency of lowering prices.

The scale of building schemes now in progress can be gauged, it is stated, by the fact that the amount of tenders accepted between April and August for the building of Japanese official buildings and the S.M.R. buildings alone reached the sum of Y.2,048,209 and 122,234 yuan. There are beside other projects undertaken by individual firms.

Among the various building projects, one of the most notable private building plan is the construction of a foreign style hotel building, of eight storeys at the estimated cost of Y.10,000,000. The building, upon completion, will be one of the finest foreign style buildings in Manchuria and will have many recreation facilities.

A gigantic plan of constructing trunk highways extending over 30,000 kilometers and branch roads extending over 60,000 kilometers throughout Manchuria has now been drawn up by the authorities of the Manchukuo Government as part of its constructive program to be executed within the coming few years.

For the realization of the huge highway construction project, a Government Road Building Bureau will be shortly established and the work would be started at the earliest possible moment.

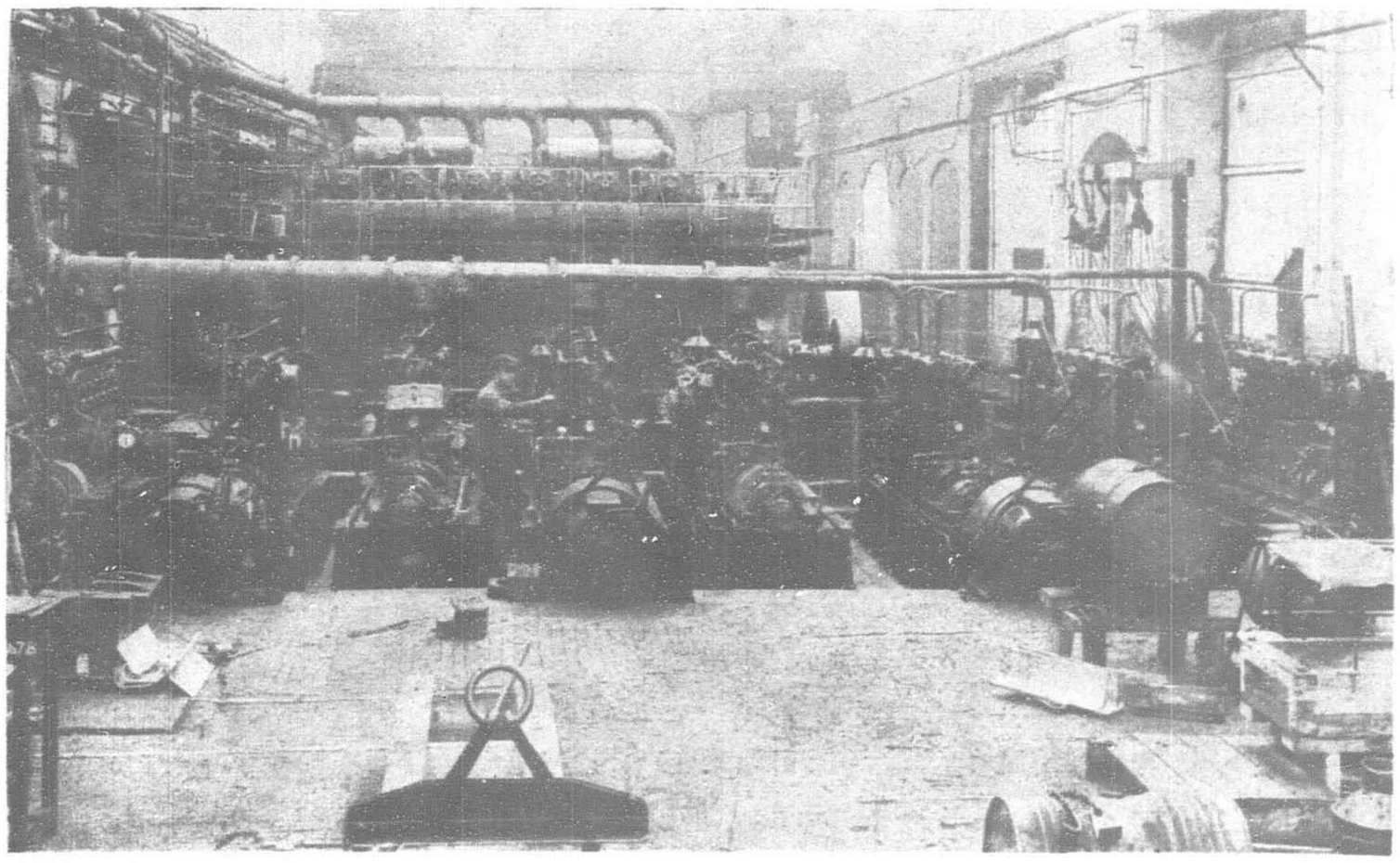
According to the plan now drawn, the project will be spread over five years, during the first year of which the most important highways extending over 6,000 shall be constructed. The rest of the work shall be carried out gradually in proportion to the funds available for this particular work.

It is announced that Mukden, Sinking and Harbin will be made the three centers of the entire highway system in Manchuria, while Sinking, the capital of Manchukuo, will become the center of the whole Manchurian road system. With the completion of this huge building project, the traffic nets will reach the farthest end of the entire domain, thereby facilitating the economic development of the territory.

In accordance of the huge constructive program of the Manchukuo Government, which is planning the development of Industry, the Mukden Arsenal, which used to manufacture man-killing implements during Chang Hsueh-liang régime, will be turned into the manufacturing plant of harvesting machines and other commercial and industrial implements. These machines are considered in urgent requirement for the development of Manchurian Agriculture and industry.

Mr. Chao Feng-ti, Director of Civil Affairs Department of the Fengtien Province, has announced that the provincial authorities are placing 150,000 yuan as the initial capital to start the constructive work in the former Arsenal. Preparations are now in progress for the commencement of the new manufacture.—*Press Union.*

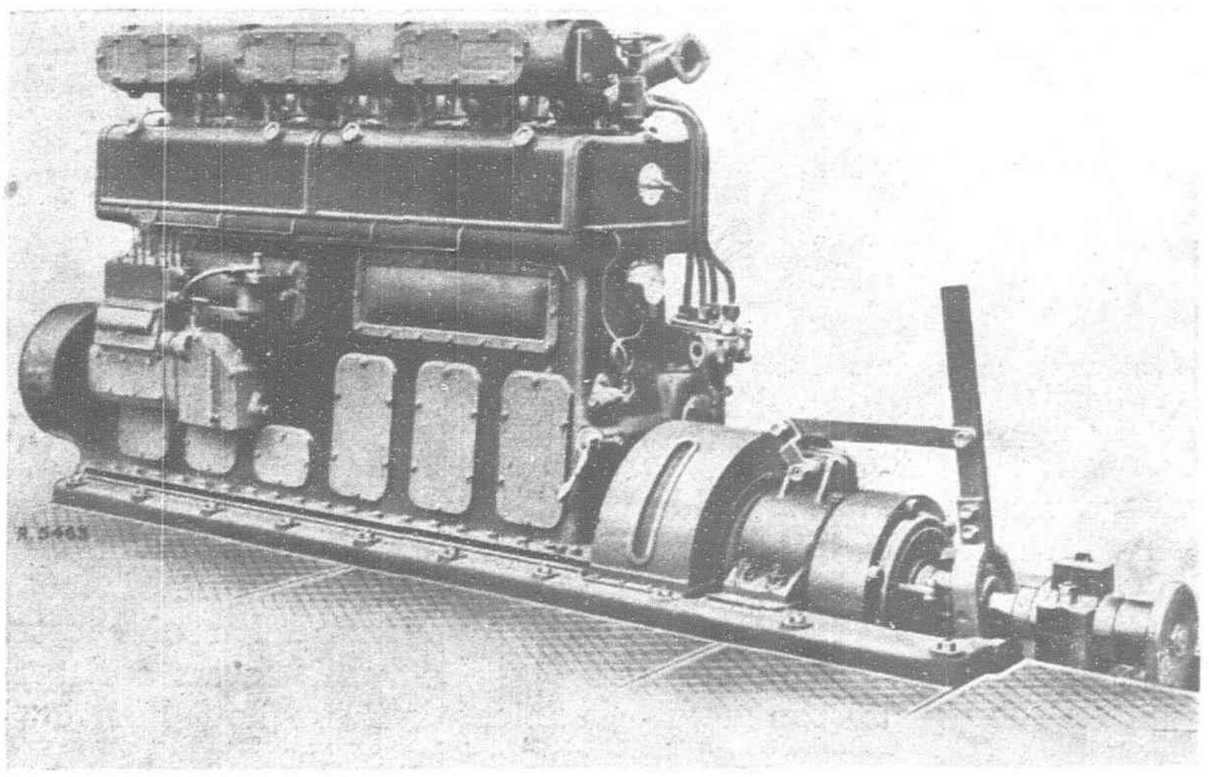
Soviet Places Big Order for British Marine Diesel Engines



Engines ordered for Russian Fishing Fleet being tested before shipment at the Ruston & Hornsby Ltd., Plant at Lincoln, England

MESSRS. RUSTON & HORNSBY LTD., of Lincoln, England, whose engines for propulsion work are sold by Messrs. Ruston Lister Marine Company, have recently executed an order for about one hundred of their celebrated VQM marine Diesel engines, which were sold to the Russian Soviet Government for use on vessels of the Russian fishing fleet. The order was placed after a group of technical experts representing the Russian Government had visited the works of a number of British and Continental oil engine makers to examine Diesel engines to supply power equipment for a fleet of new Russian fishing vessels. The British firm supplying the engines were pioneers in the development of the modern oil engine using heavy fuel for marine duty. Details with regard to the engines purchased by the Russian Government are of interest and are as follows :

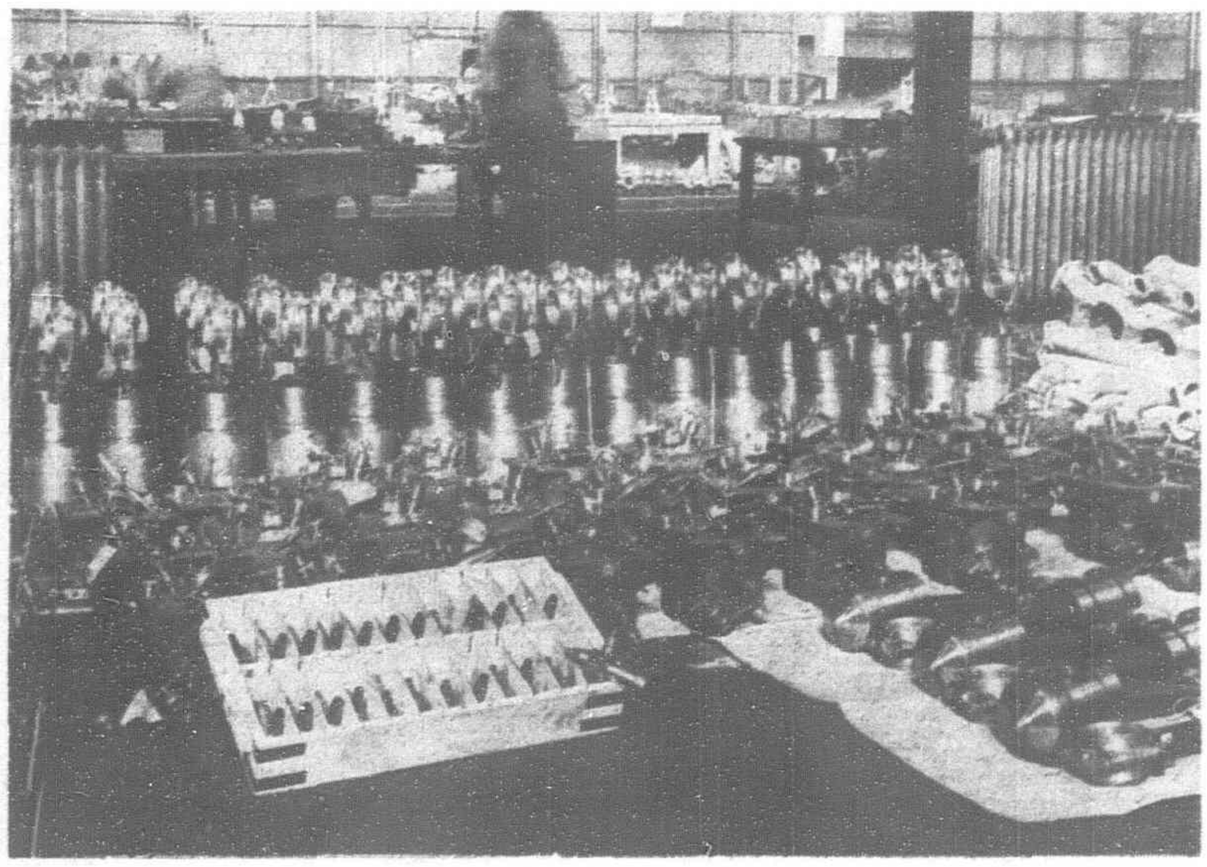
The bedplate is of deep section and of substantial design, extended to carry the reversing gear. Faced on bottom flange which bolts to the engine seatings, and accurately machined to take the main bearings. After machining the bearing horns are finally scraped to a mandril of the finished outside diameter of the bearing shell, thus ensuring perfect alinement of all bearings. The housing is a separate casting of substantial design entirely enclosing the main reciprocating and revolving parts, constructed to form a water jacket and accurately machined to carry the cylinder head and liner, and provided with doors which permit of easy access to the main bearings and connecting rods. The crankshaft bearings are of best anti-friction metal; of very generous dimensions, accurately machined and easily renewable. Lubricated direct from the positively driven pump with an abundant supply of oil.

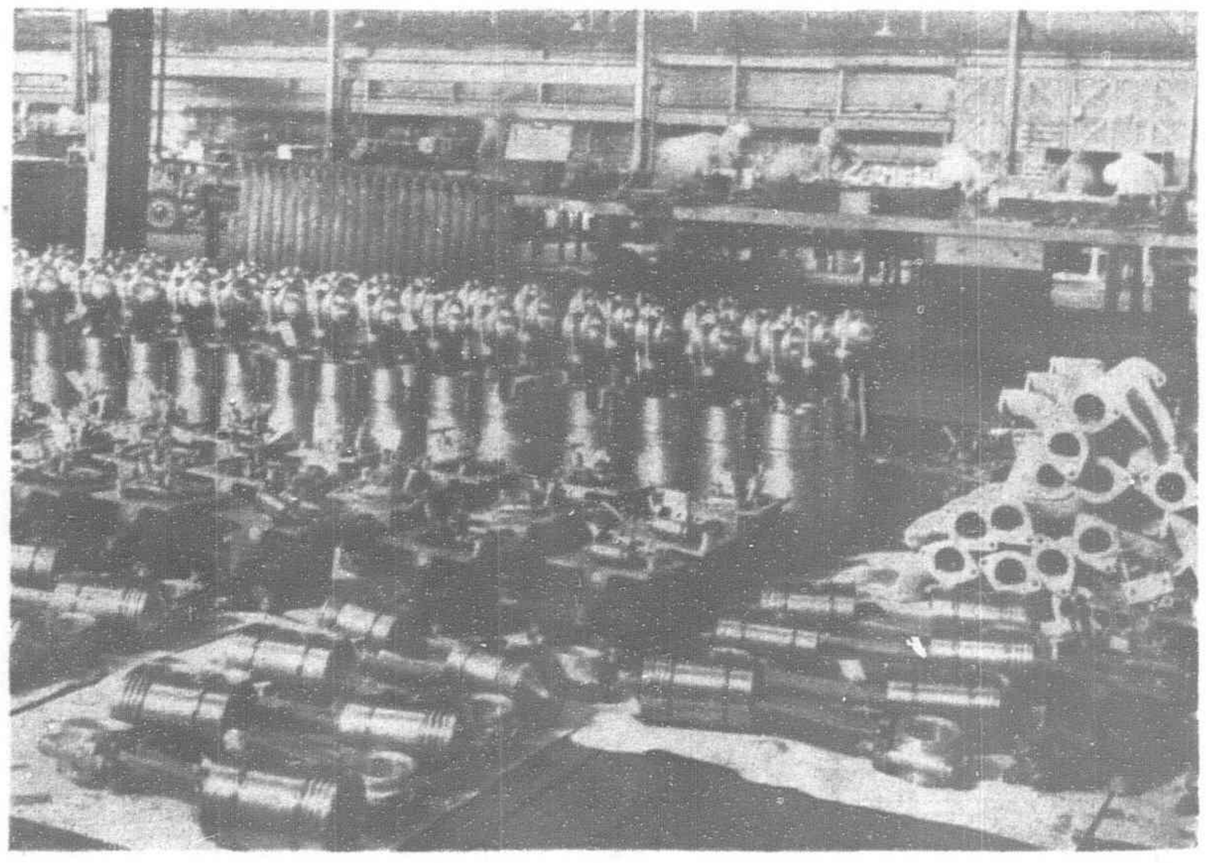


Showing one type of engine, 6 VQM being supplied in big order for the Soviet Government

The cylinder heads are separate castings of close-grained cast iron, bolted to the housing. The bolts are not exposed to the corrosive action of the cooling water. The cylinder heads embody well-known Ruston features, they are accurately machined to carry the inlet valve, exhaust valve, the Ruston atomiser, and the necessary starter valves. The cylinder heads are entirely water-jacketed and cleaning doors are provided. The inlet and exhaust valves are arranged in a horizontal position opposite each other thus permitting the exhaust gases to be taken out at the top of the cylinder heads. Each cylinder head is fitted with a pressure relief valve. The cylinder liners are separate castings, renewable and of specially close-grained cast iron, machined and ground to give a perfect working surface for the piston.

The piston is of specially close-grained cast iron, annealed after rough machining, and finished with a high degree of accuracy. Fitted with easily renewable rings, and floating gudgeon pin, with the area of the combustion loaded surfaces increased compared with





The two pictures above show parts of the Ruston & Hornsby VQM marine engines manufactured for the Soviet Fishing Fleet

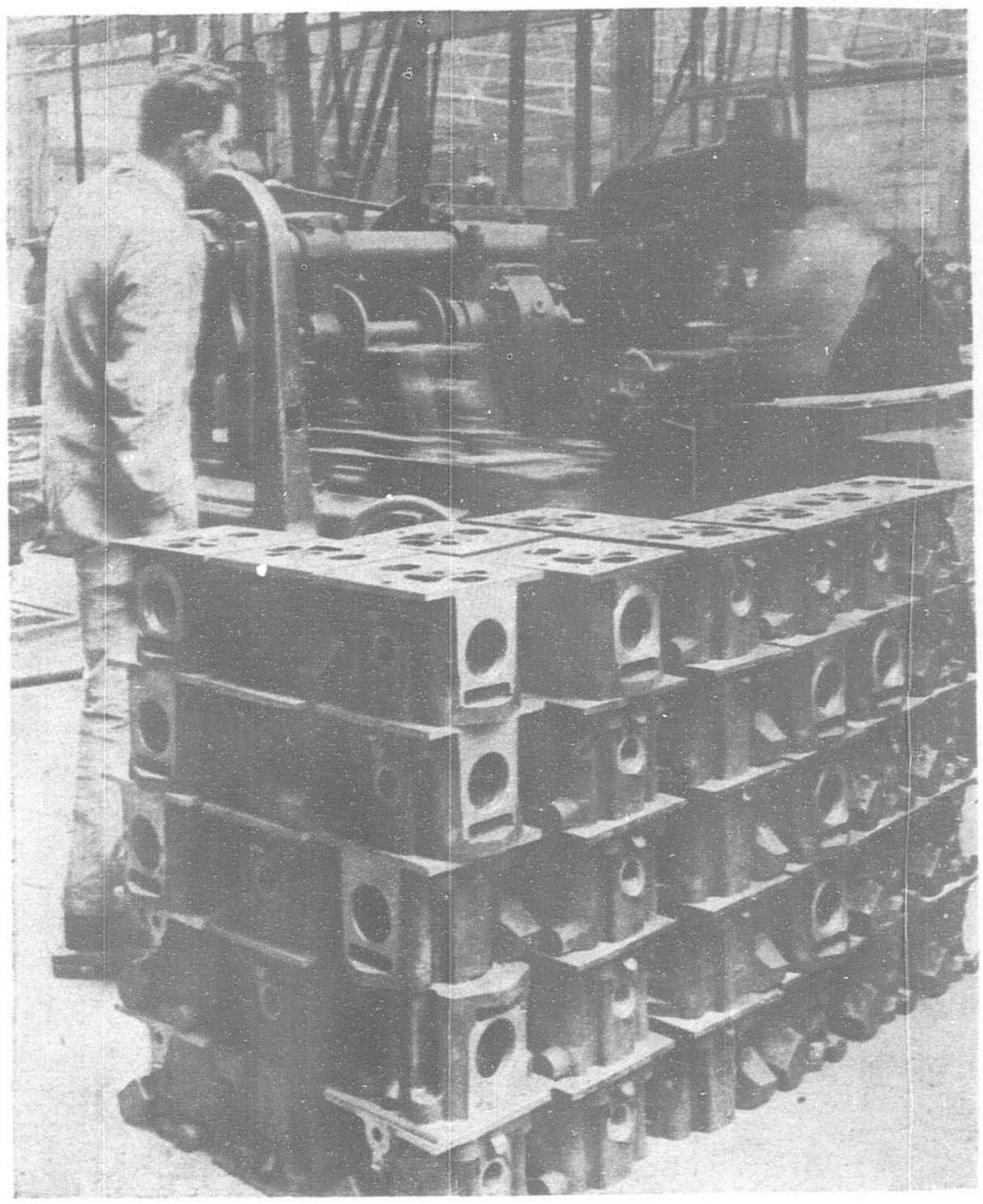
the inertia loaded surfaces. The connecting rods are high-class steel stampings, of H section, and are fitted at each end with bearings of ample proportions. The large end bearing is adjustable and the small end designed to have an extra large wearing surface on the pressure side.

The crankshaft is machined from a solid forging of 30/35 ton tensile steel. Machine ground, finished and balanced within very close limits. Material is proved by laboratory test on each crankshaft. The gears, driving direct from the crankshaft, operate the camshaft, fuel pump, governor, lubricating pumps, water circulating and bilge pumps. Each wheel has accurately machine-cut helical teeth, which ensure silent running. The gears are completely enclosed and run in oil. The camshafts carrying cams for operating the inlet and exhaust valves and the fuel pump are of steel supported in long bearings. Cams are machine formed, hardened and ground. They are totally enclosed and silent running.

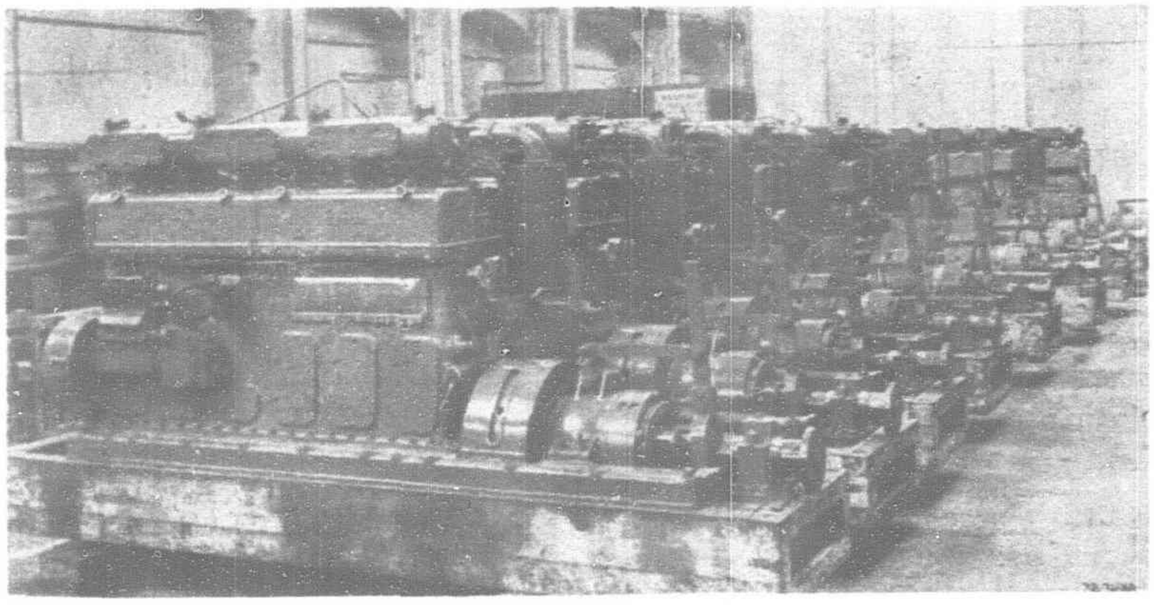
The inlet and exhaust valves are operated by separate cams. They are manufactured from special heat-resisting steel, truly turned and ground on their seats. The governor, of the centrifugal type, is gear driven from the crankshaft and regulates the quantity of fuel delivered to the engine in accordance with the requirements of the load, and in such manner that the timing of the injection is constant. The power strokes are continuous and vary only in intensity, ensuring smooth running and close speed regulation. A hand speed regulator is fitted.

Fuel injection follows closely the well-known Ruston system, which ensures a uniform load distribution between the cylinders. The fuel pump body is machined from solid forged steel. The pump is driven by quick acting cams operating through a roller direct on to the fuel pump plunger. The atomisers are of simple design, reliable and efficient, free from all delicate valves and complications and constructed to atomise completely the fuel upon entering the cylinder. These atomisers of which Ruston & Hornsby Ltd. are the original patentees, are readily accessible, automatic in action, and require no adjustment. The pumps are of the plunger type and made entirely of bronze, operated through reducing gears from the end of the engine crankshaft.

Effective lubrication is maintained under constant pressure by twin-gear pumps, one pump supplying the lubrication to all main wearing surfaces, the other for draining the return oil from the sump to the storage tank. All bearings are flooded with oil and the crankshaft is drilled to lead the oil to the connecting rod large end bearings. The lubricating oil distributing pipe is fitted with a pressure relief valve and also with a reliable pressure gauge. One filter for the fuel oil and one for the lubricating oil are fixed to the engine.



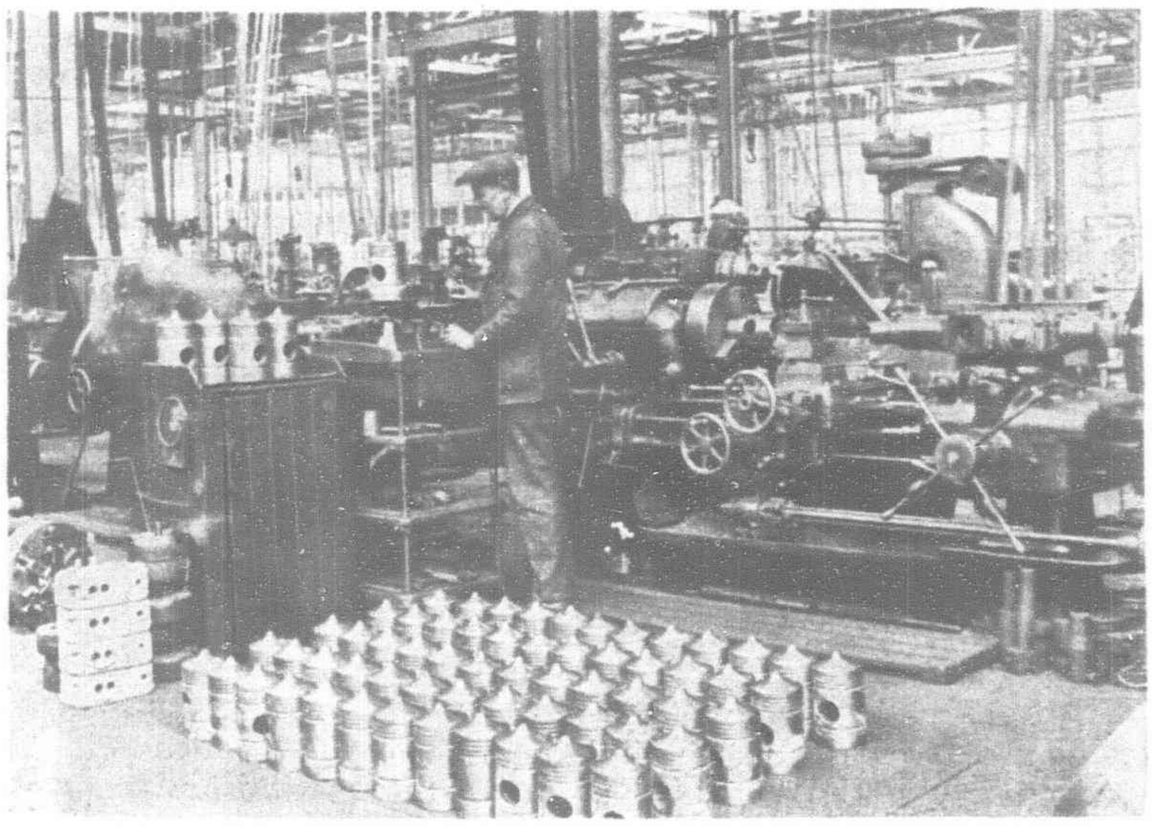
Milling Cylinder Heads

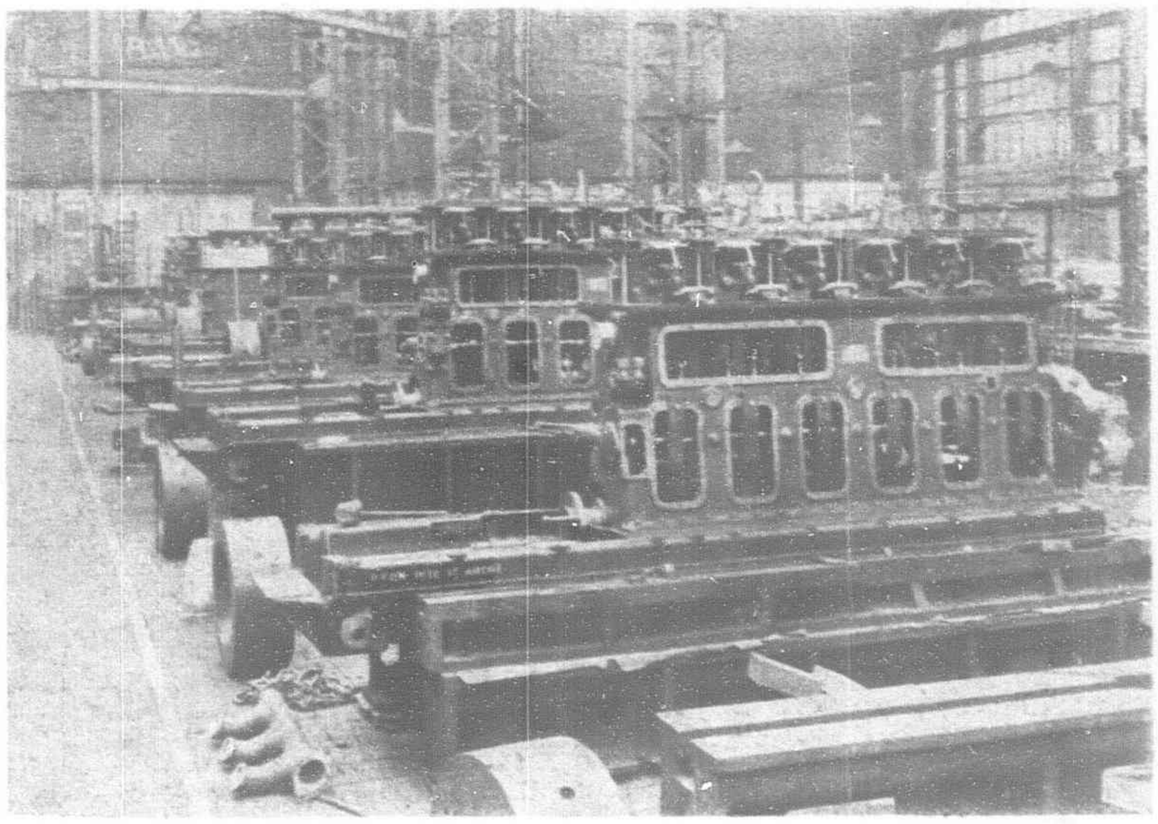


Group of the VQM marine engines ready for shipment from Lincoln, England

The flywheel is of cast iron, truly turned on face and rim, and carefully balanced. The boss of the wheel is faced and drilled for bolting direct between the crankshaft flange and the reversing gear half coupling, thus ensuring perfect alinement. A water-cooled exhaust manifold is supplied arranged for taking the exhaust either fore or aft as desired.

Reversing gear is of the geared type and is of robust design and strong enough to

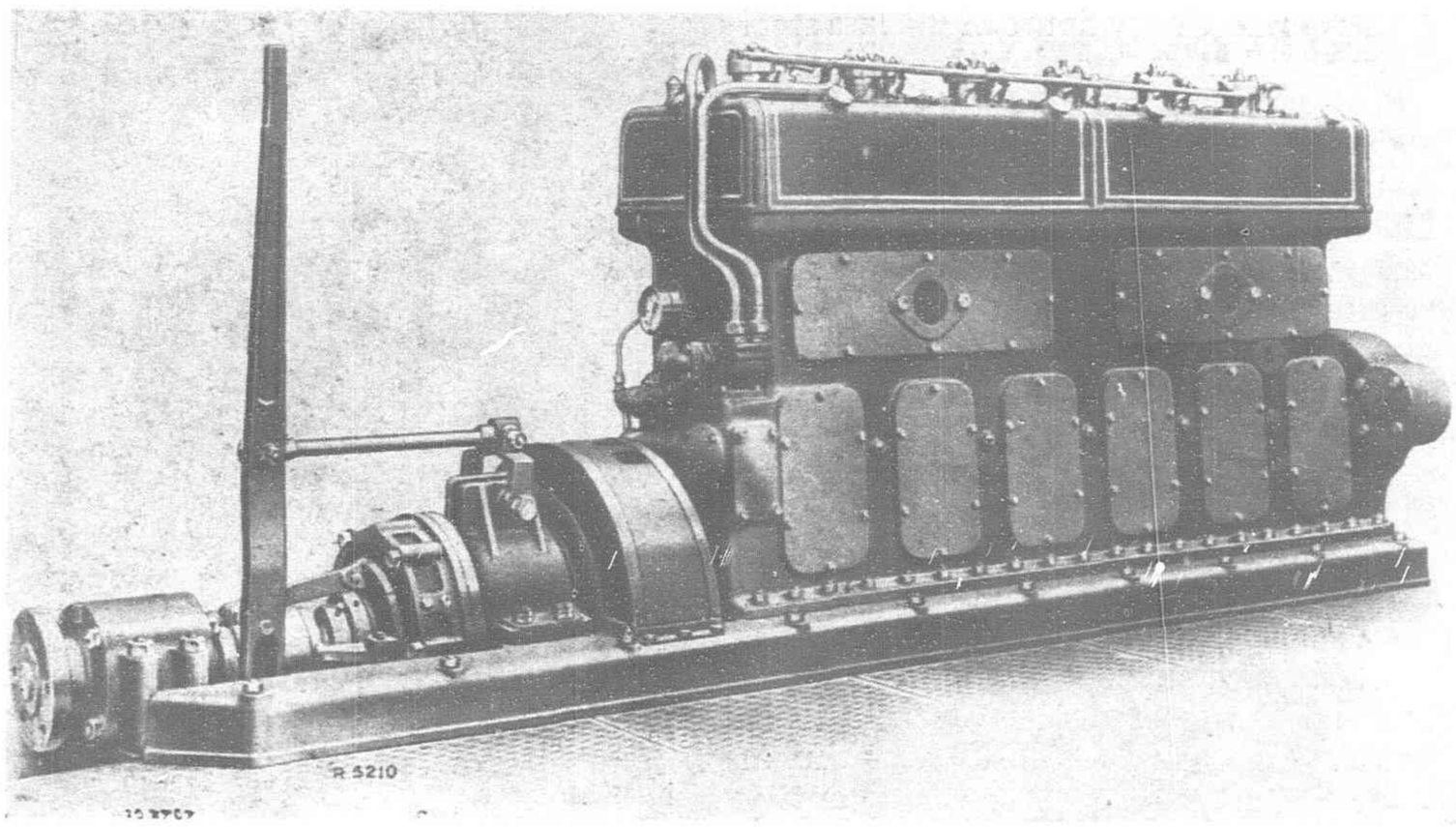




Showing the VQM marine engines in course of erection, at Left Machining and Balancing Pistons

transmit the full power of the engine. It is fitted with a half coupling for bolting to the intermediate shaft coupling.

Reduction gear, recommended for slow speed boats of under eight miles per hour is connected direct to the aft end of the reversing gear. The casing for the reducing gear is arranged for water cooling. The reduction gears run in lubricating oil and a gland is fitted to the aft end of the lower shaft thus preventing oil leakage or the admission of bilge water. Ball thrust and journal bearings are also fitted to the reduction gear.



6 VQM Marine Diesel Engine 96-104 b.h.p.

The standard propeller shaft is of steel with keyed on coupling and taper for propeller. The propeller is three bladed and accurately balanced. The stern tube is cast iron and steel with internal stuffing box bearings and outside bearing formed by renewable bush four times the shaft diameter in length. When supplied in bronze the propeller shaft is of manganese bronze and the stern tube is formed by cast bronze ends with solid drawn bronze tube between.

A full-way shut-off valve or cock is supplied for fitting to the ship's skin and a large perforated metal strainer which can be easily removed for cleaning while running. Day service gravity feed fuel tanks are of welded steel and galvanized inside and outside after welding, and fitted with sump and the necessary connections.

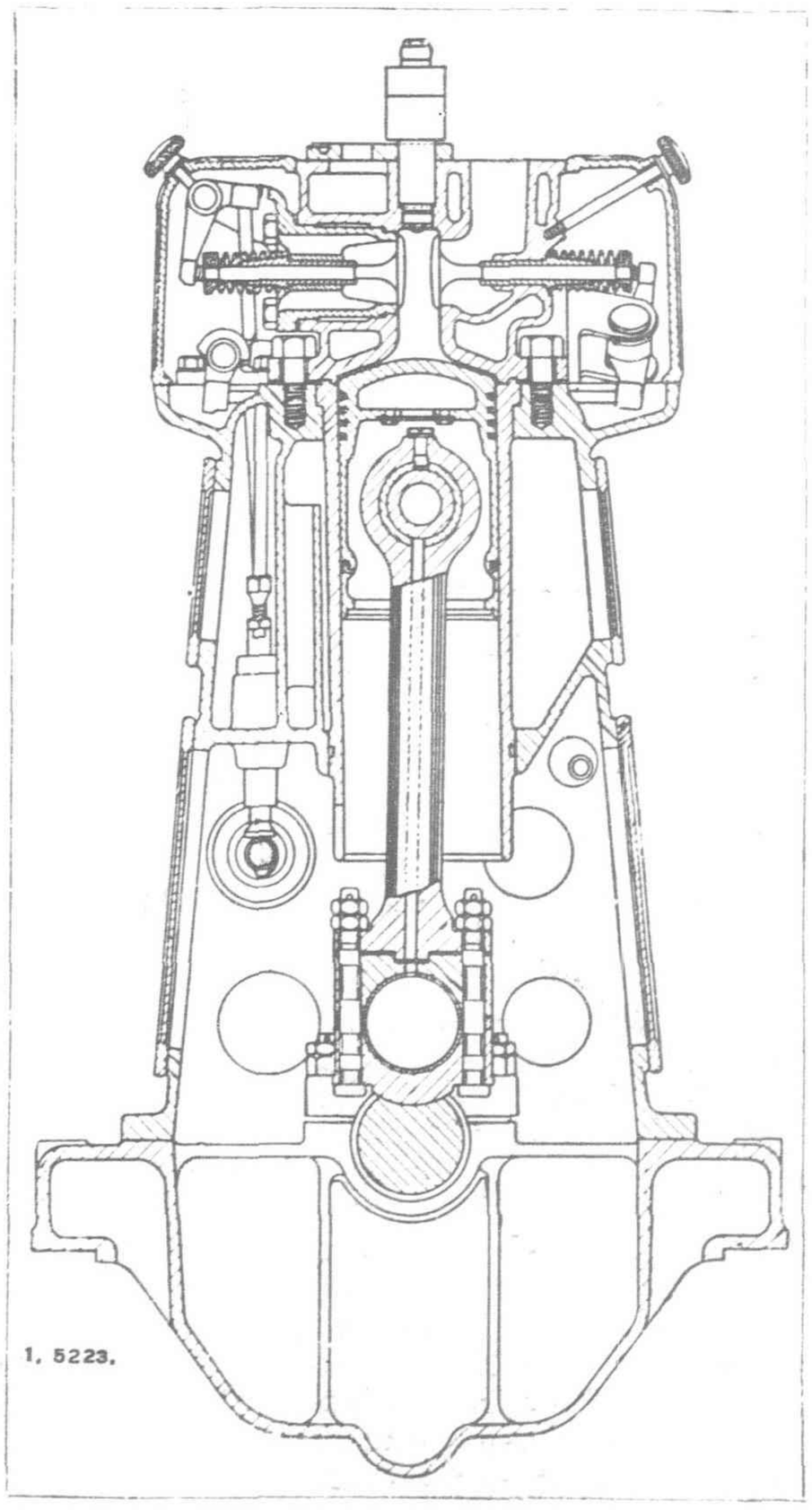
These engines start easily from cold, compressed air being used to impart the initial revolutions. Standard equipment consists of a suitable air receiver complete with fittings, stop valve, pressure gauge and safety valve. Provision is made for charging this air receiver from one of the engine cylinders which is fitted with a charging valve. The standard arrangement of Automatic Starting Valves is for three and four cylinder engines to be fitted with two starting valves, and the six cylinder engine with four valves.

As an alternative to charging the receiver direct from engine cylinder a compressor, gear driven by the engine, is also supplied.

The standard equipment can be depended upon, subject to reasonable care on the part of the attendant, but to provide for cases in which the air pressure may be lost—due to inexperience, etc. —an independent power driven compressor set can be supplied. In districts where high pressure air can be obtained in cylinders these can be safely used to replenish the air receiver, provided a suitable reducing valve is fitted between the air cylinder and the receiver. This latter method can be used also for inital charging of the receiver when a power starter is not fitted.

Engines and auxiliary equipment are designed for " handing " when they are arranged symetrically about the center line of the vessel and run in opposite directions. The standard engine rotates clock-wise looking aft or anti-clockwise looking forward and requires, therefore, a left-hand propeller. If a reduction gear is fitted, the propeller revolves in the opposite direction to the engine rotation. The design and construction of these engines is such that they comply with Lloyd's and other Registration Societies highest requirements, first-class workmanship and material being employed throughout.

Each engine before leaving the Works is tested to full satisfaction for such time as is necessary to ensure that it can develop the power quoted as a working load. Each engine is further tested for half an hour at a B.H.P. of 20 per cent in excess of such load. All powers quoted are obtained with fuel oils of not less than 19,000 B.T.U.'s per lb. (10,600 calories per Kg.) gross calorific value and viscosity not exceeding 75 secs. at 100° F.—B.E.S.A. Spec. A.



The VQM Diesel Engine

New Canton Aerodrome

With the removal of the Canton Air Force to its present headquarters at Shau Kau Ling, plans are being made for the construction of an extensive aerodrome to facilitate the movements of the local squadrons. After much consideration, a decision has been reached to have the new aerodrome built at the locality known as Sam Yuen Li and Ngau Lan Kong. An area forming a very large tract of level land, is available in this locality, and a very large aerodrome will be constructed. General Wong Kwong-yui, commander of the Air Forces has appointed a special committee to attend to matters dealing with the projected aerodrome, for which large areas of private fields will have to be acquired. Owners of affected property are being asked to submit their proofs of ownership for examination so that compensation may be considered.

It is expected that the aerodrome will take about six months to complete.

The Provincial Government is also considering seriously the inauguration of civil aviation within the province. At the request of Chairman Lin Yun-kai, members of the Air Force recently undertook investigations to select a site for an aerodrome for civil planes following the introduction of civil flying. It is understood that two places in Honam Island, in the vicinity of Po Kong and of Whampoa, respectively, have been found by the investigators to be suitable for the construction of small aerodromes and it is understood that these sites will be chosen when more definite plans relating to civil aviation in the province are completed.—*Canton Gazette.*

Wireless in Central Java

Amazing Developments at Malabar

By A. J. MILLING JONES, M.A., in Eastern Engineering and Commerce

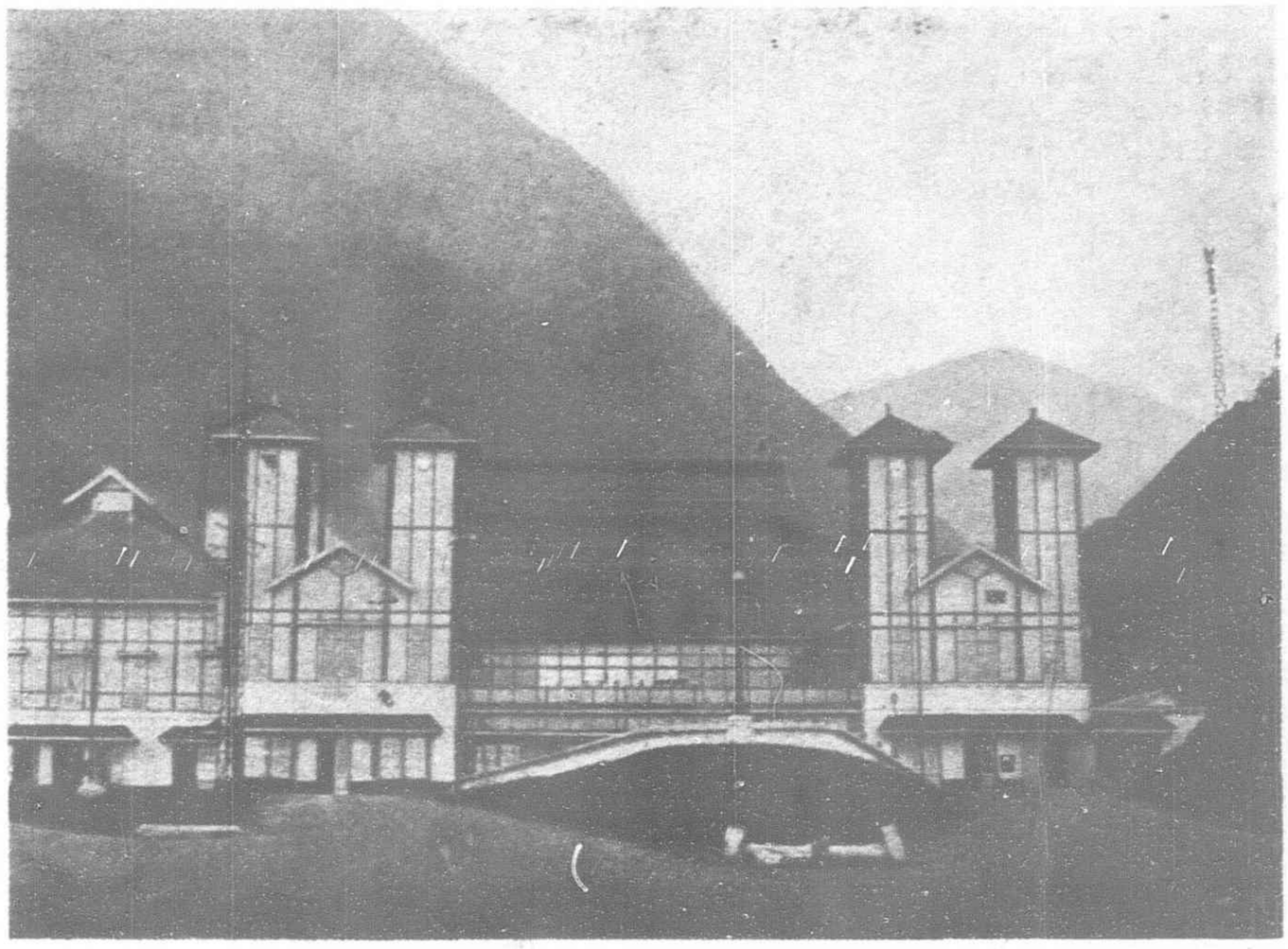
ALTHOUGH it is scarcely fifteen years since the first radio installation was erected in Java, wireless communication there has made amazingly rapid progress, so that to-day Java is able to talk direct to Europe and America.

The history of the development of the Malabar radio station near Bandoeng, Central Java, speaks eloquently of this progress. In 1917 Dr. Ir. De Groot, returning to the East Indies from Holland, began with the erection of a receiving installation borrowed from the "Telefunken" Company, and when this had been completed it became obvious that messages could be received from several European and American transmitting stations. Special observations were taken and deductions were made about the power and wave-length necessary for transmitters.

The next task confronting the originator of the idea that a direct and wider wireless communication between Java and the rest of the world was technically possible, as well as politically necessary, without reliance on intermediary relaying stations, was to get mere data.

Once the site of the Malabar mountain was selected for this purpose it was vital to success that the very best provisional equipment procurable under the circumstances should be used in forwarding further experiments. To this end a small system was built up with the aid of an electric dynamo and an airplane motor of 125 h.p., and a temporary antenna was constructed in the cleft of the mountain. From March, 1918, onward signals were sent out regularly, and from time to time various improvements were made, and eventually a new dynamo was purchased in Japan. Even so communication with Europe was not yet good enough to warrant a regular traffic over the greater part of the day, as stronger transmitters were required for really first class results to be possible. Accordingly a big arc transmitter of 2,400 kw. primary power was made in the East Indies from Dr. De Groot's designs, and placed in the great central building at Malabar, where there was also room enough for a second big arc transmitter, two 200 kw. arc transmitters, a small spark transmitter, and a Telefunken alternator-transmitter of 400 kw. antenna power.

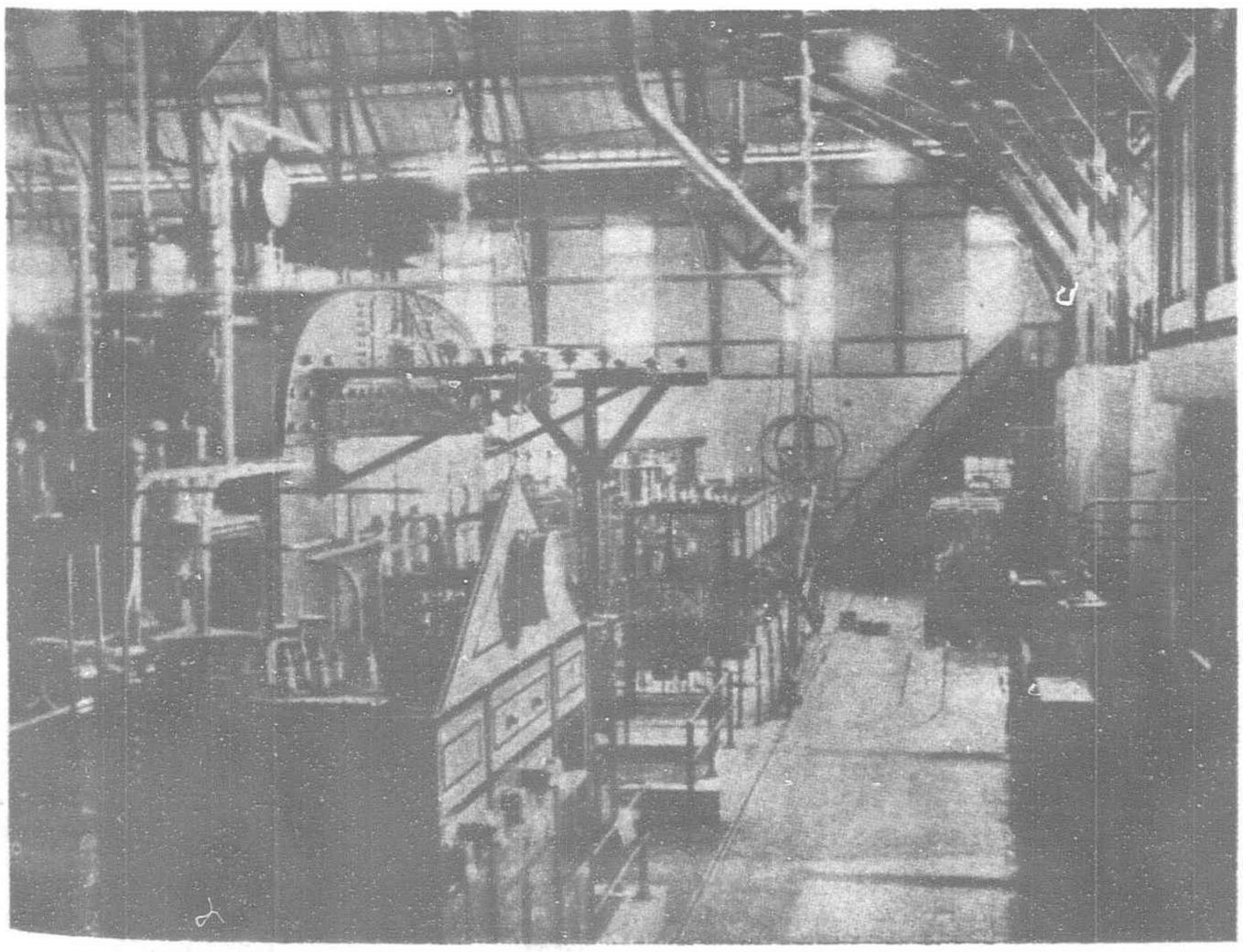
On May 5, 1923, communication with Holland was opened officially, and in the years immediately following with many other countries also. In 1927 a new period commenced in Javanese radio development.



Malabar Radio Station, Central Java

Hitherto the transmitters used were based on the long-wave system, but of late years short-wave transmitters had begun to make their entrance into the wireless world, rendering valuable telephonic and telegraphic assistance, and giving reliable, if not as yet magnificent results. By the end of 1928 a brand new short-wave transmitter of great power was projected, with two beam antennæ for different waves.

The drastic change brought about in wireless development by the discovery of short-waves is reflected to-day in the station at Malabar, now one of the most up-to-date wireless transmitting stations in the world. The whole station is housed in different buildings, and the main part of it is nearly a mile distant from the entrance. Directly behind this main building is a transformer-station and a workshop, two water-turbine power stations and new buildings for beam transmitters. Between the transformer station and the five towers of the central building is a storehouse, and to the left, on the slope of the mountain, are the cooling installations, the antennæ and the installations for electric power supply. In all at Malabar there are four water-power stations and one station with steam engines. In each case, of course, the energy is transferred as a three-phase current of 50-cycles at a 25,000-volt tension. The long, overhead line connecting the five stations supplies the whole plateau of Bandoeng with its electrical energy. The four sets of three lines connecting the electric power stations north and south of Malabar are well protected from storms. Special lightning arresters, consisting of horn-gaps and resistances, have been evolved, and the great importance of these can be easily understood when it is realized that even a very small thunderstorm can sometimes seriously interfere with transmission. The lines are also connected to oil circuit breakers, and to the 25,000-volt bus-bars of the transformer station. Moreover, a high-tension protector has been provided, and the necessary current and voltage transformers are mounted for the measuring instruments.



Great Arc Transmitter at Malabar

In separate cells three transformers of 2,000 kw., three-phase, 25,000-6,000-volt are mounted, and there is one cell available for a fourth spare transformer. On a switch-board the instruments for the selective protection of the outdoor lines and the differential protection of the transformers are mounted so that in case of a disturbance on the outdoor line the faulty line is automatically disconnected, and a spare line immediately put in function by the selective protector arrangement. A breakdown in the interior of the transformer is unlikely, but should this occur the transformer in question is automatically connected on both sides. At any instant the energy can be read on a self-recording kilowatt meter.

With the machines which provide the energy for the transmitters are also direct current dynamos of 110-volts. The four big motor generators, each with a 3-phase

A side view of Malabar Radio Station in which Mr. De Nopper, the Chief Engineer appears

alternating current motor of 1,760 h.p., 6,000-volts, driving two direct current machines of 312 kw., 1,760-2,000-volt., each were delivered by the International General Electric Co. Connected in series the dynamos provide the direct current for the great arc-transmitter. When working in parallel, two of these sets provide 2,400 kw. by a tension of 3,500-4,000-volts.

Other machines aiding the electric energy of the transmitters are two motor generators, a rectifying motor, two 750-volt motors for the upper magnet coil of the great arc, and two 500-cycle rectifying motors as well as four smaller motors for direct current supply and battery loading.

Of the eight transmitters, perhaps the most interesting is the great arc transmitter of 2,400 kw., a photograph of which is shown here. The weight of the magnetic circuit is 184,000 kg., and the bronze arc chamber 4,000 kg. Additional pieces weigh 6,500 kg. The magnetic field is obtained by an oil-cooled coil within a tank at the lower side, and an air-cooled coil on the upper side of the arch chamber. The weight of the lower coil is 6,000 kg. and of the upper coil 14,000 kg., and the attractive power of the two iron cores is 60,000 kg. With a wave-length of 15,600 meters the ordinary tension is 2,600-volts, the primary current being about 700 amperes, and the aerial current about 500 amperes. If so desired wave-lengths of between 7,800 and 18,000 meters can be used.

Two of the five short-wave transmitters are arranged for telegraph and telephone. They have one wave-length only, and possess a common modulation and signalling device which means that they cannot work at the same time. The three remaining telegraph transmitters share two signalling arrangements, and a considerable saving of time is thus obtained as two of them can work together.

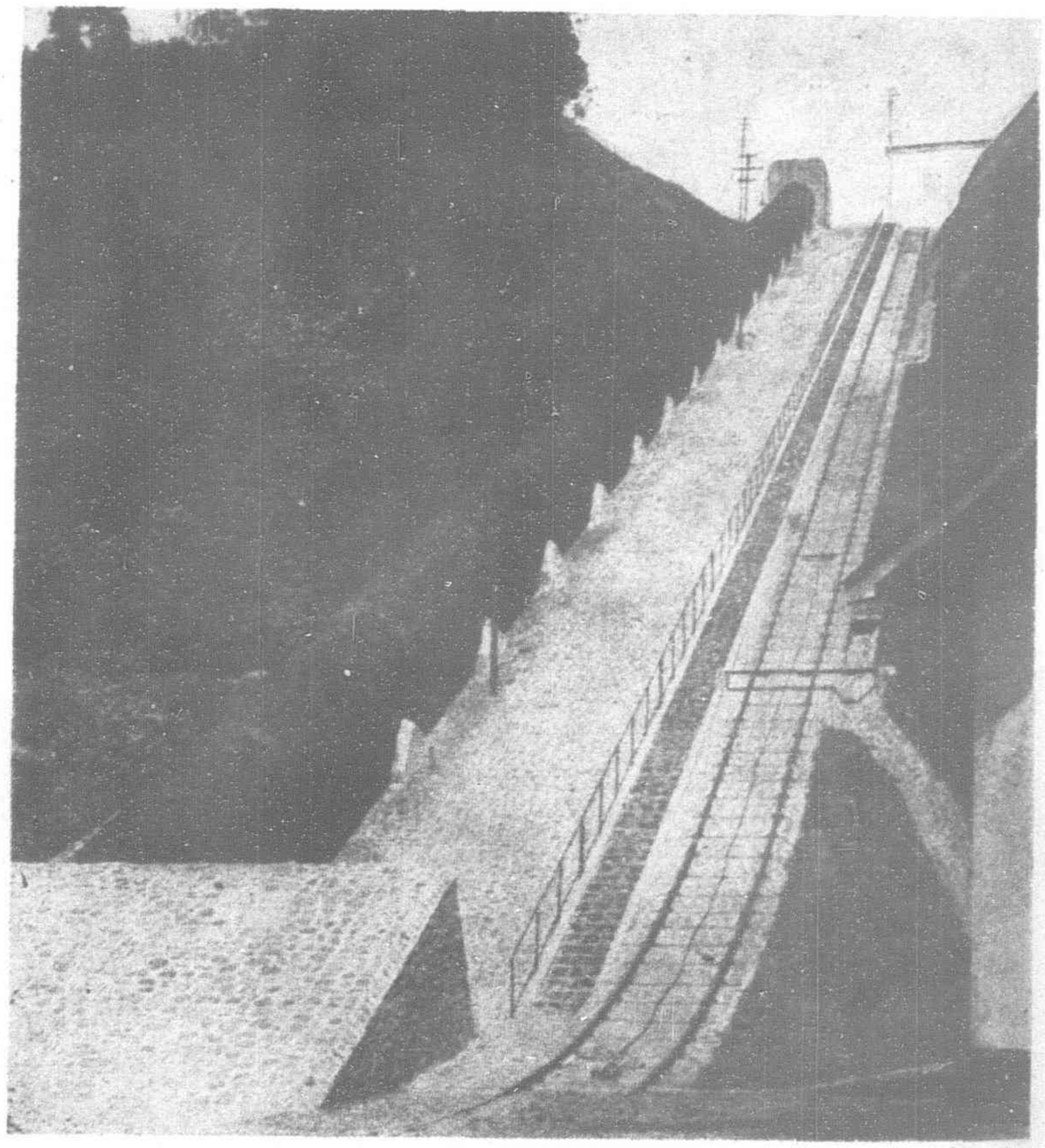
Among the many other modern installations at Malabar there are five antennæ for short-waves and two beams have been constructed on a separate front. The short-wave aerials are hung on steel wires fastened in front of the central building's wooden towers to the steel masts which were formerly used for the great mountain antenna. They all consist of two horizontal stranded copper wires (11 mm. thick), except one aerial, for a 16.8 wave-length, which has two pairs of bronze reflector wires 3½ mm. thick as well as active antenna wires.

Besides the equipment mentioned above four antennæ for long-waves, a particularly ingenious water-cooling device, and several additional arrangements, including a fire brigade, are well worth mention. The heated water is drawn off into a reservoir slightly to the left of the main building, where it is partly cooled by surface cooling. Spraying, which is the art of reducing the temperature of the water to a minimum, is conducted by contact with the air at a higher level reservoir. The water is pumped up by electricity, and it falls in a number of thin sprays, to be led back to the arc through pipes and filters.

The complete success of the Malabar radio station is emphatically a triumph for its designer, but Dr. De Groot was not permitted to see these magnificent results. He died on August 1, 1927, on his way to the Washington Radio Conference of that year. Even now, however, there are still many points requiring further experiment. There is always much to be done to keep a radio station up-to-date and in the best possible condition. As soon as the latest machines are in working order their lessons must be learnt, classified and stored away against the time when a still newer experiment will be attempted. For in the near future radio-vision will be attempted.

A Java Pipe Line

The high-pressure pipe line of the Kratjak hydro-electric works on the Island of Java is about 110 yards long. The lower part of the pipe line where the pressure is high and all the distributing piping was supplied by Sulzer Brothers, whilst the upper part of the pipe line was constructed in Java. The pipe consists of autogenously welded sections riveted together on site. The diameter



Sulzer high-pressure pipe line, Kratjak hydro-electric power station, Java, service pressure 160 lbs. per square inch. Section between anchorages 16 and 17

varies between 7-ft. 3-in. at the top and 5-ft. 7-in. at the bottom. The connecting branches for the turbines are 3-ft. 4-in. in diameter. The thickness of the plate used in the pipe line increases from 12 mm. (about ½-in.) at the top to 16 mm. (⅝-in.) at the bottom. The weight of the part of the pipe line supplied by Sulzer Brothers amounts to 200 tons.—*Eastern Engineering & Commerce.*

Savage Gold

By ALEKO E. LILIUS

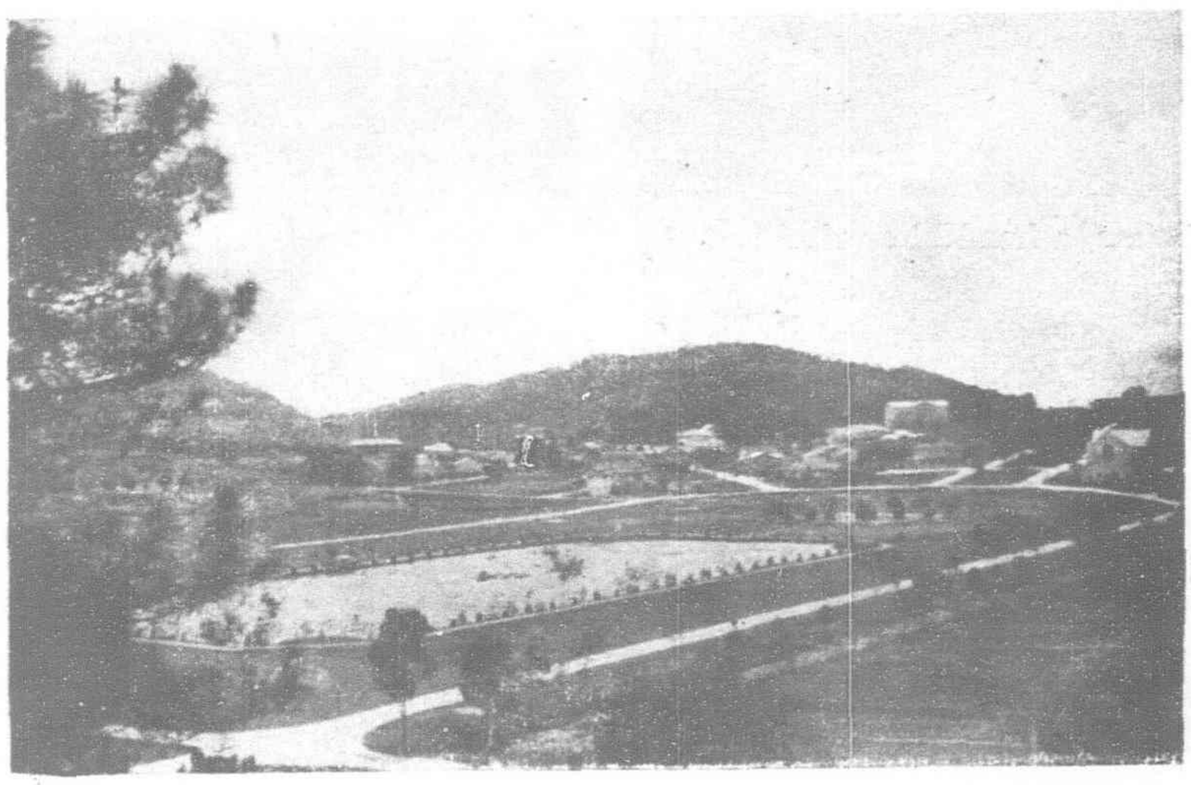
The Hills of Baguio hold an abundance of Gold

It was not a whiskey-million tale, although it was told to me in a bar at Baguio—the Baguio Café to be exact. It is here the prospectors, miners and other old-timers meet. Most of them are grizzled "thirty-year-men" who landed in the Philippines with the army back in '98.

That night over our glasses, I was told an astonishing tale which I at first discredited as another "bonanza" story. I was told that there were millions, no—billions in mineral wealth, chiefly *gold*, slumbering in the hills of northern Luzon. I was told that in some places the discoveries had been so rich that the savages, Igorotes and Ifugaos, had made themselves plates, dishes, cups and even hats of heavy, hammered, virgin gold.

I told them frankly that I was hard to convince. "Show me!" was my journalistic motto, I said.

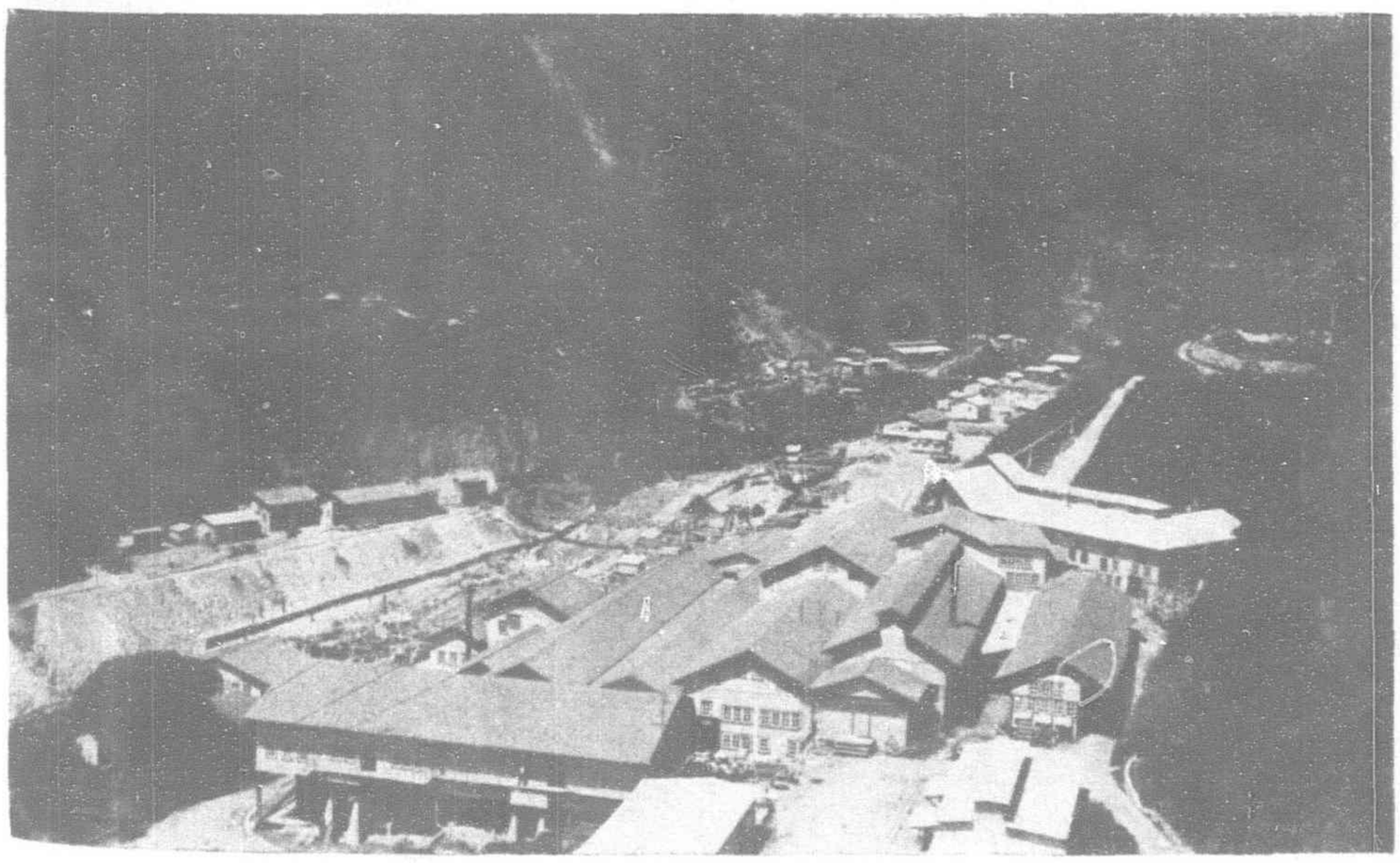
At this writing, many months later, I have to admit, that what they then told me was the truth, every word of it. For I have seen those dishes and cups of hammered virgin gold. Savage Igorotes have shown me the sites of their forefathers' mines, still worked by the wild hill men and their women. I have climbed the cloud-topped mountains of Baguio, Benguet, and Bontoc and I have seen the gold bearing ore, in hills thousands of feet high, with the quartz veins running in streamers along the slopes and reaching no one knows how deep. Lastly I have seen gold poured into bullion to the value of almost one hundred thousand dollars (U.S.), the result of two weeks mining and milling at a plant of only three hundred tons daily capacity.



Baguio long has been Summer Capital of the Philippines

When these prospectors and miners first told me the story of all this hidden wealth in the Luzon mountains, I even suspected ulterior motives behind all this braggadocio. Concluding that all they wanted was publicity or that it was only another stock selling scheme or high pressure propaganda, I never paid another moment's attention to what they had told me. I promptly forgot the matter and went south, visited the Sultan of Sulu, the pagan Sea Gypsies of Tawi-Tawi, the fighting Moros of Mindanao, the pearl divers of Jolo, and lastly, because of lack of other material, I decided to take a look at the headhunting savages of northern Luzon.

So I went to Bontoc. At the outset I found the Igorotes immensely interesting. Since the advent of the Americans, they have officially discarded their ghastly passion for human heads—at least they are seldom caught at it—although there is little doubt that they still practice headhunting. On the whole, the American administration has left the pagan hill men alone to pursue their old customs, to pray and sacrifice to their old gods, or to get baptized if they chose to do so. I stayed days and weeks with them until they learned to know me and to trust me. Sitting around their council fire they told me many strange tales of sorcery and witch-craft, of the Great Spirit Lumawig, who, once upon a time, taught them how to take human heads and where to find gold for their sacred charms and ornaments. Lastly I got into the good graces of a witch, String-of-Teeth, who told me about Lumawig's abode in the "highest of mountains" where the gold was plentiful. I struck out for it but never reached the goal, because on my third-day out from Bontoc the wild men, spears and headaxes in their hands, surrounded our little party and told us to return.



Balatoc—One of the Richest Gold Mines in the World

Discoveries at Bagun

Now I began to realize that what these old prospectors and miners had told me many months ago in the bar at Baguio had not been idle talk, that an unusual and true story lurked somewhere behind it all.

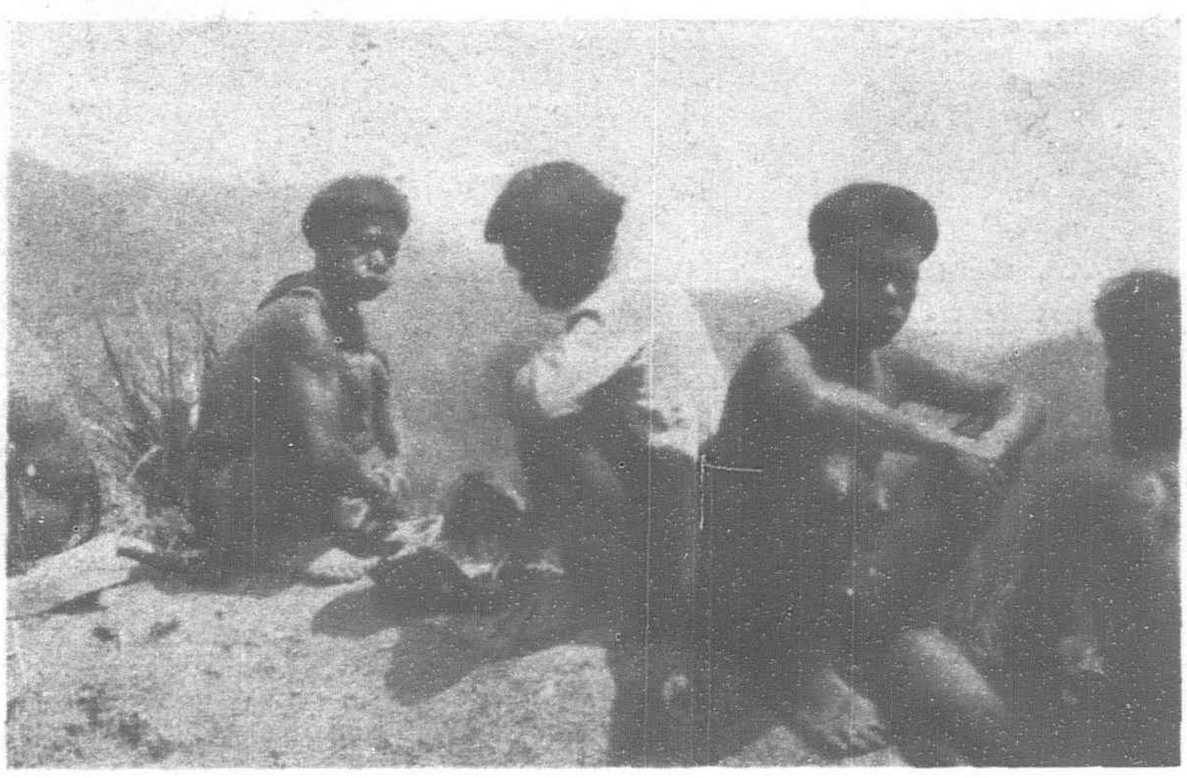
During the last eighteen months, new and important discoveries of rich gold ore have actually been made in the hills of Baguio and Benguet, and in sufficiently large quantities to warrant the building of expensive plants, while

gold has been taken out of the mines to the tune of almost $200,000 a month from each of them.

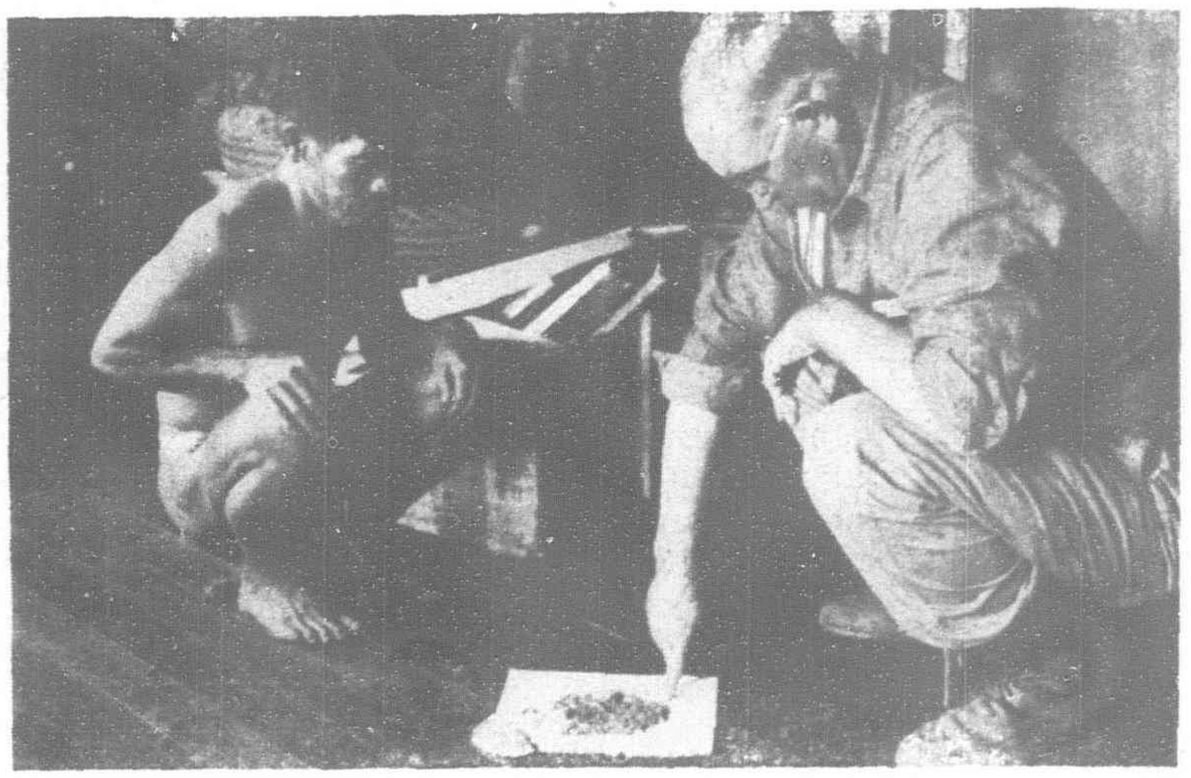
After all, can anybody wonder that I at first had discredited these yarns of the Luzon gold riches. To be sure, one has heard of Alaska, Klondyke, South Africa, and Australia as rich gold producing countries, but who ever heard of a golconda in the Philippines? True, there have been tales in circulation about gold somewhere in the Islands. Somebody has said (or written), that the island of Mindoro derived even its name from *Mina de Oro*, gold mine, while others maintain that the island got its name from its golden sun-sets and glorious evening skies. However, there *is* gold in Mindoro. There is gold in Mindanao, Siguyan, Masbate and Panaon, too, and in Camarines—a province in southern Luzon —gold is scooped up with dredges from old river beds.

The scepties may ask: Why is it, if the Philippines are as rich in gold as this author says, why is it, that the country has not long ago been overrun by prospectors? Why has not a feverish mining industry long ago developed in this "fabulously rich territory"? After all, the country is under the American flag, they may add. Surely American capital and enterprise would have found their way into the Philippines to assimilate those alleged tremendous profits. No, no one has ever heard of Philippine gold. Buncum!

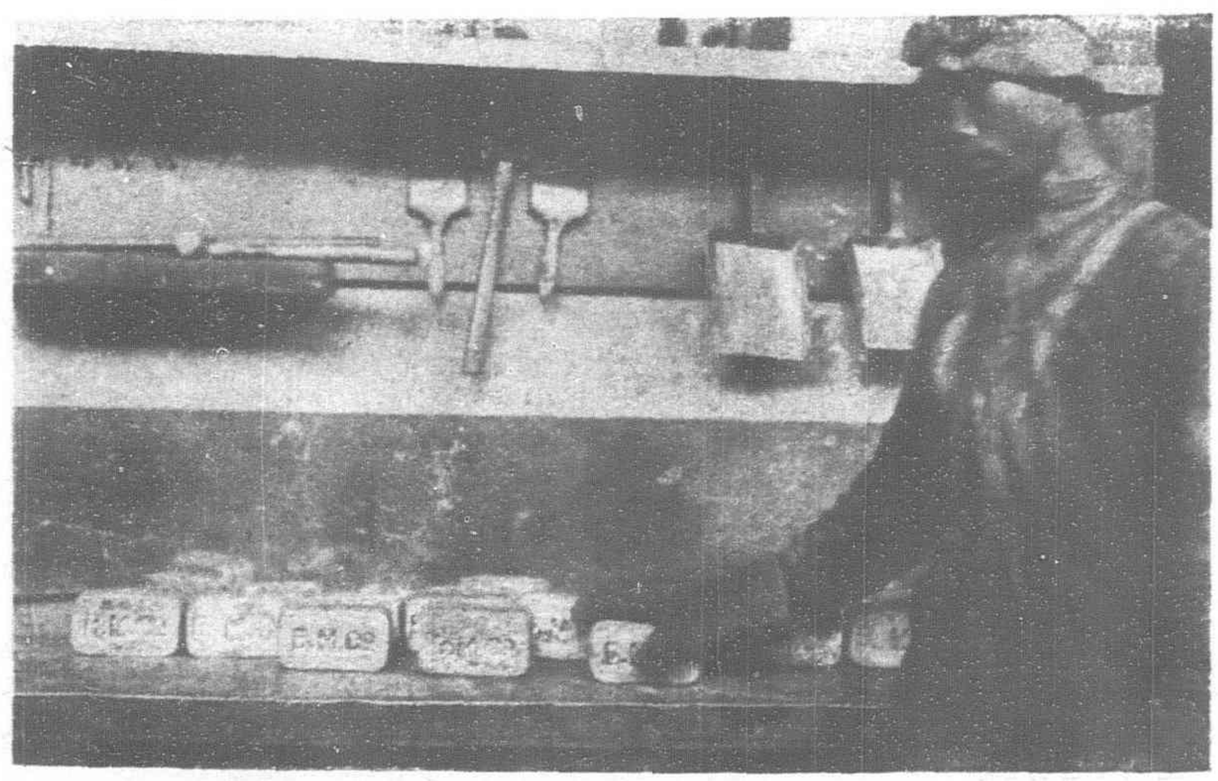
A few courageous attempts to work some of the Luzon mines were made and, at length, a lot of money was lost. Consequently, one did not have to go all the way to America to hear sarcastic remarks in connection with Philippine gold. The Manila capitalists were able to supply them a-plenty, and only after American



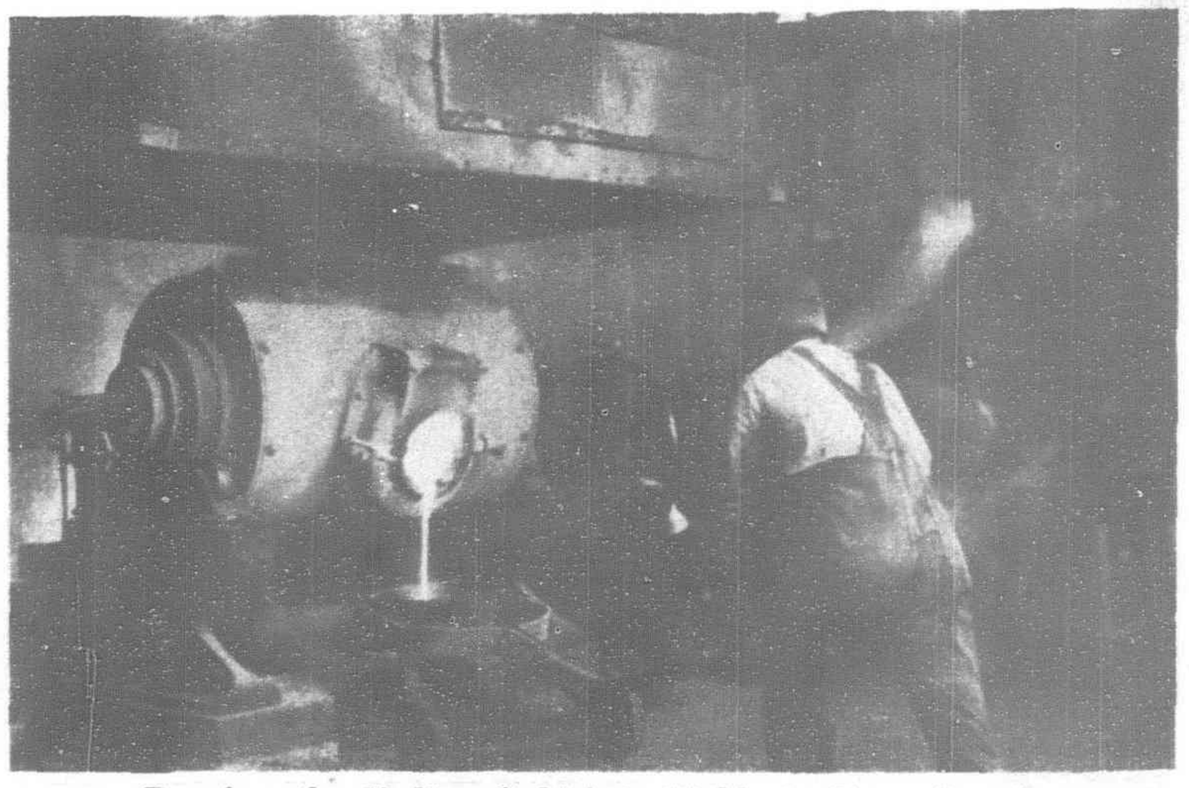
Savage Miners at Rest—Meal time, a handful or rice



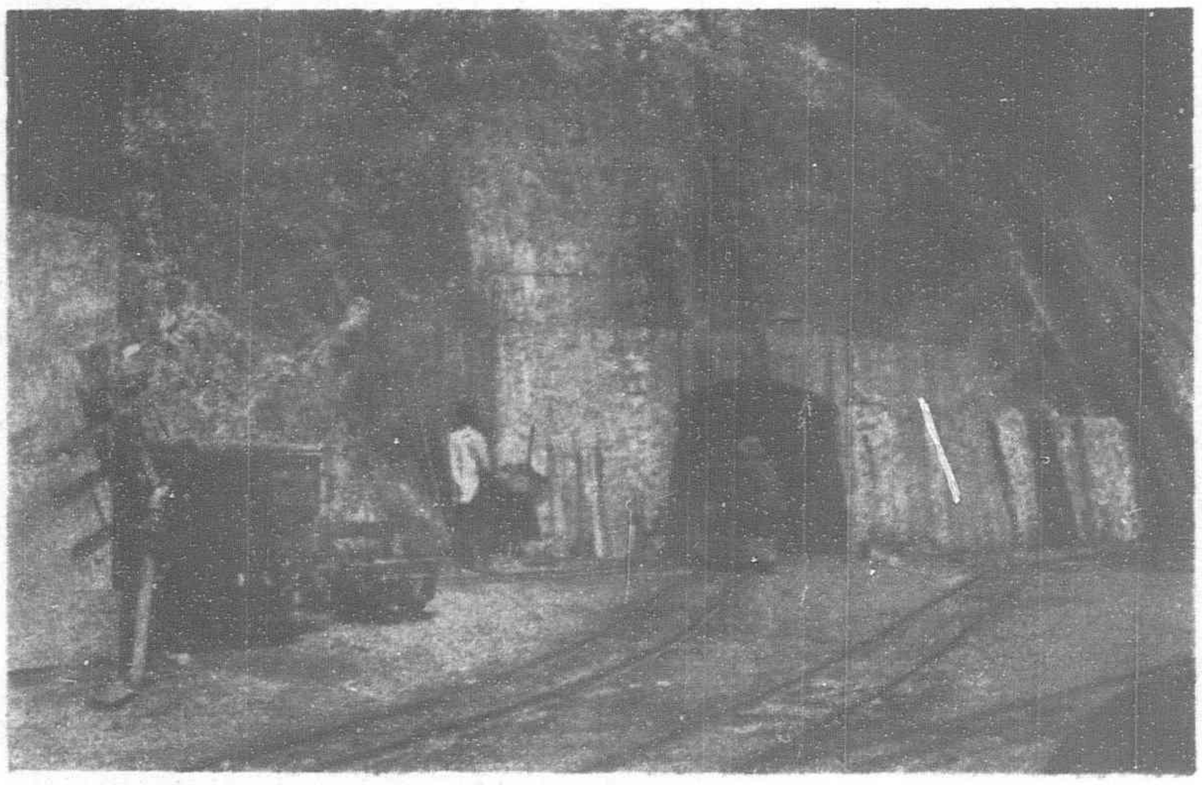
Gold Nuggets



Each Ingot is worth about $2,000 U. S. Currency



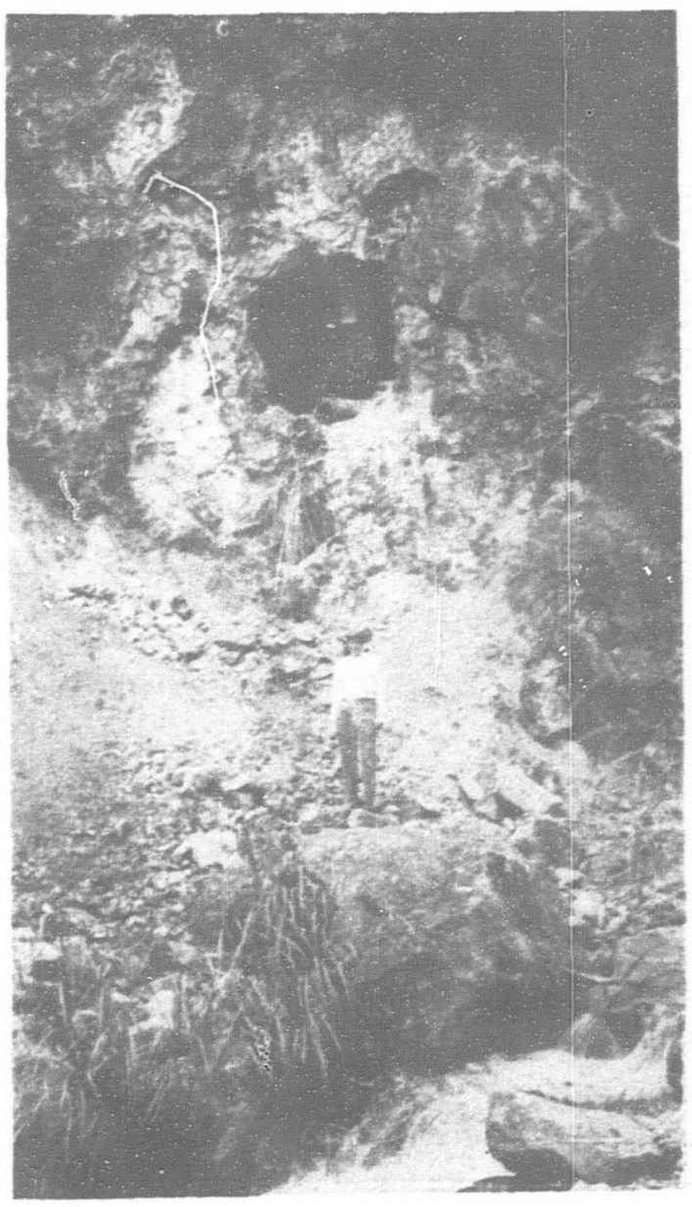
Pouring the Molten Gold into Molds to Form Ingots



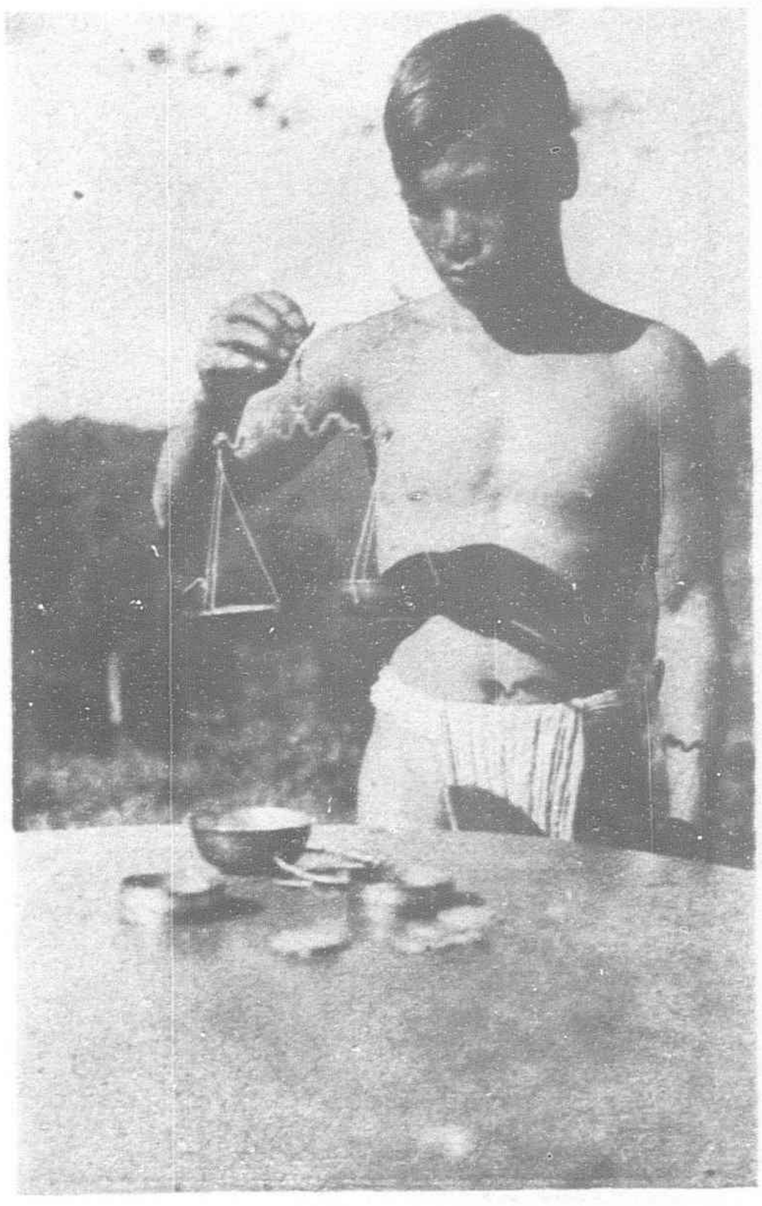
Ore Train entering the Main Tunnel of Balatoc Mine

The Author (in center) returning with Mining Superintendent Montague (right) and another official after visiting Balatoc Mine

A Young Igorot at work



Old Igorot Mine—Hundreds of these dot the Hill Country of Northern Luzon



Cup, Dishes, Bracelets and Anklets of heavy, hammered Virgin Gold

engineers, men with great experience and men of science, had arrived and made certain statements, people began to take notice. These engineers promptly declared that the reason why the previous endeavors to extract the gold from the ore had gone wrong was not the absence or scarcity of gold. Far from it. The gold was plentiful, but the methods used by the old miners had been all out of date. The gold was either so finely divided or combined with other minerals, that the old processes of panning or amalgation were out of question. To-day, three of the mines, Antimok, Balatoc and Itogon are working full blast, using modern methods and I understand that shares of the first two companies cannot be bought on the open market. Needless to say, their dividend checks are fat.

American capital hesitates to enter wholeheartedly into this newly discovered gold field, because the United States are about to give away all this untold, hidden wealth. And yet, United States took the Philippine Islands by force of arms and treaties, and paid for the privelege of owning them $20,000,000. In time the American government spent the tenfold this initial investment. Hundreds of American men and women laid down their lives—killed by natives or tropical maladies—for the benefit of educating and civilizing a people who are now clamoring for independence and whose highest wish is to cast off the hated American yoke.

Consequently, to the Filipinos, the news of the rich gold discoveries in the Philippines is not welcome. Perhaps, it has been hushed up for political and also for business reasons. The politicos are afraid that this news might at length hamper their aspirations for national freedom. In fact, information about the gold finds in Luzon has been guarded so well, that it will be "hot news" to many readers.

Mines Centuries Old

Still, as far back as a thousand years ago, Chinese chroniclers mention a group of islands to the south of their empire as a rich source of gold. They call these islands "Gold." The rich silver producing territories to the west, the Malay provinces, they call "Silver" (Perak or Pilak). Chinese coveted this gold and no doubt it was Chinese who first taught the hill men of Luzon those advanced methods of mining which are still in use by the Igorotes and Ifugaos.

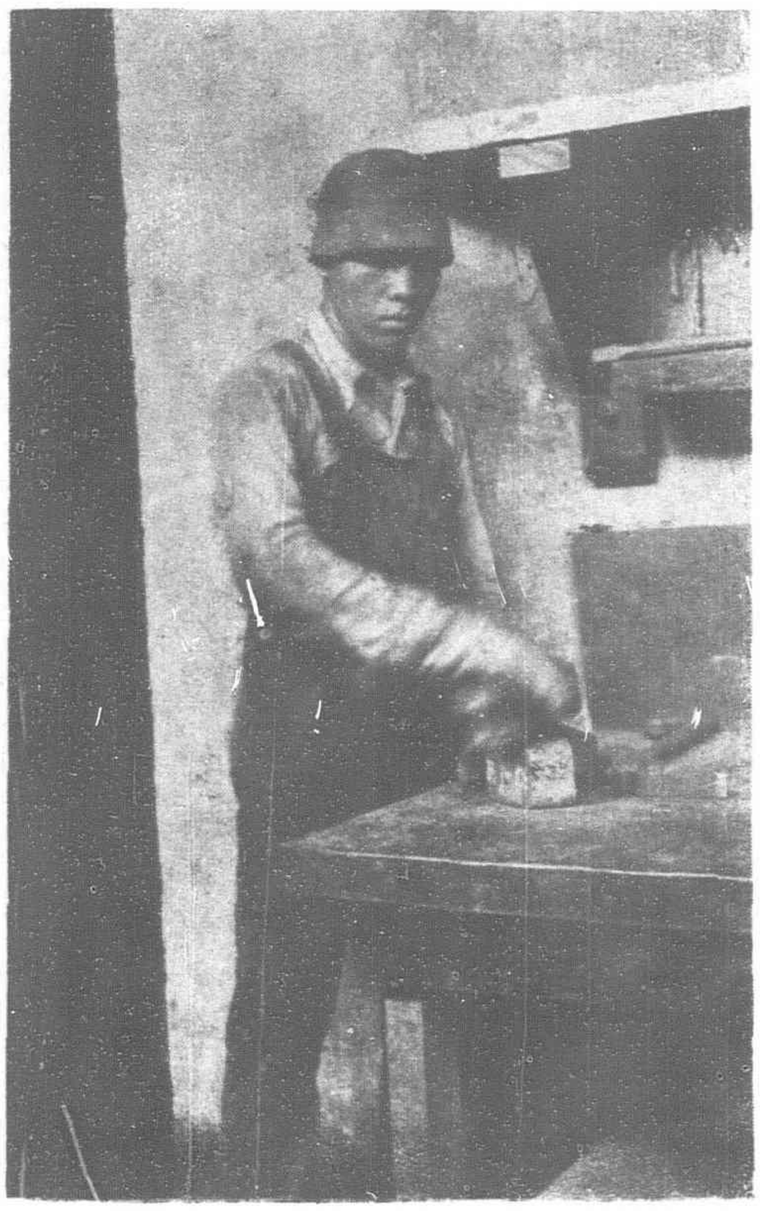
The Spaniards, always alert for colonial treasures, soon found out about the abundance of gold in the hill country. They persecuted and harassed the natives until these, in despair and to save themselves and their families from torture and death, finally disclosed the location of some of their mines.

Naturally, with the advent of the Americans, the fantastic tales of an enormously rich gold regien in the Luzon mountains soon reached the ears of many Yankee adventurers. Many left the army and to go prospecting. Comparatively few of them made good, however. But there were many reasons for their failure; first: the presence of headhunters; second: the absence of what is generally known as "free" gold; and last: the liquor. Only a few of them made a strike, stayed and those are to-day the back-bone of the Baguio community.

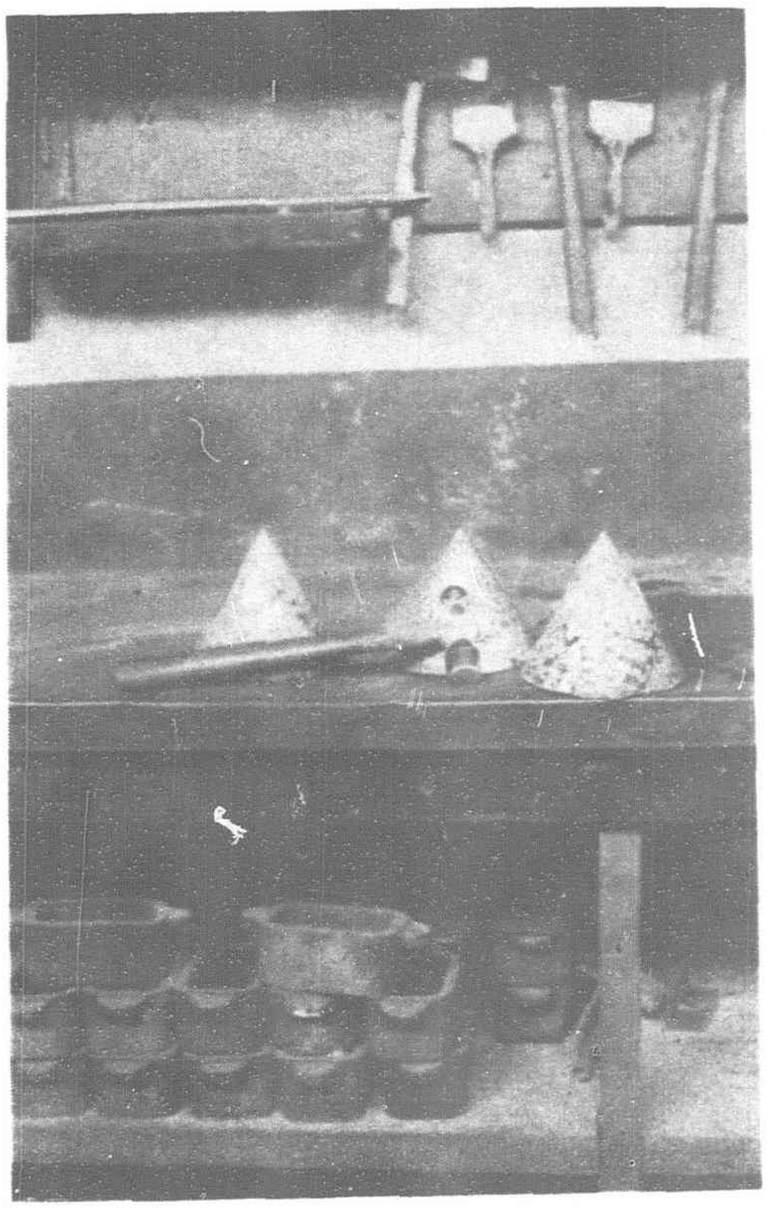
One of them is Pat Hoover, the owner of Baguio Café. He owns a couple of small mines, a saw mill and a few houses in the city of Baguio. Located about 500 feet above sea level and only 165 miles north of weltering hot Manila, Baguio has long been known as the Summer Capital of the Philippines. Its climate is delightfully cool all year round, and last but not least, its pine covered slopes make one forget the tropics.

Hill men saunter down to Baguio to sell their gold, dust, nuggets or "pancakes." Most of them find their way to Pat Hoover's office. Here they squat for hours on the floor without saying a word. Pat Hoover knows why they have come to him. At last he takes them inside his inner office, and there, from the folds of their scant dress, the gee-string, they bring forth their precious little packages, the result of their and their fellow tribesmen's labors.

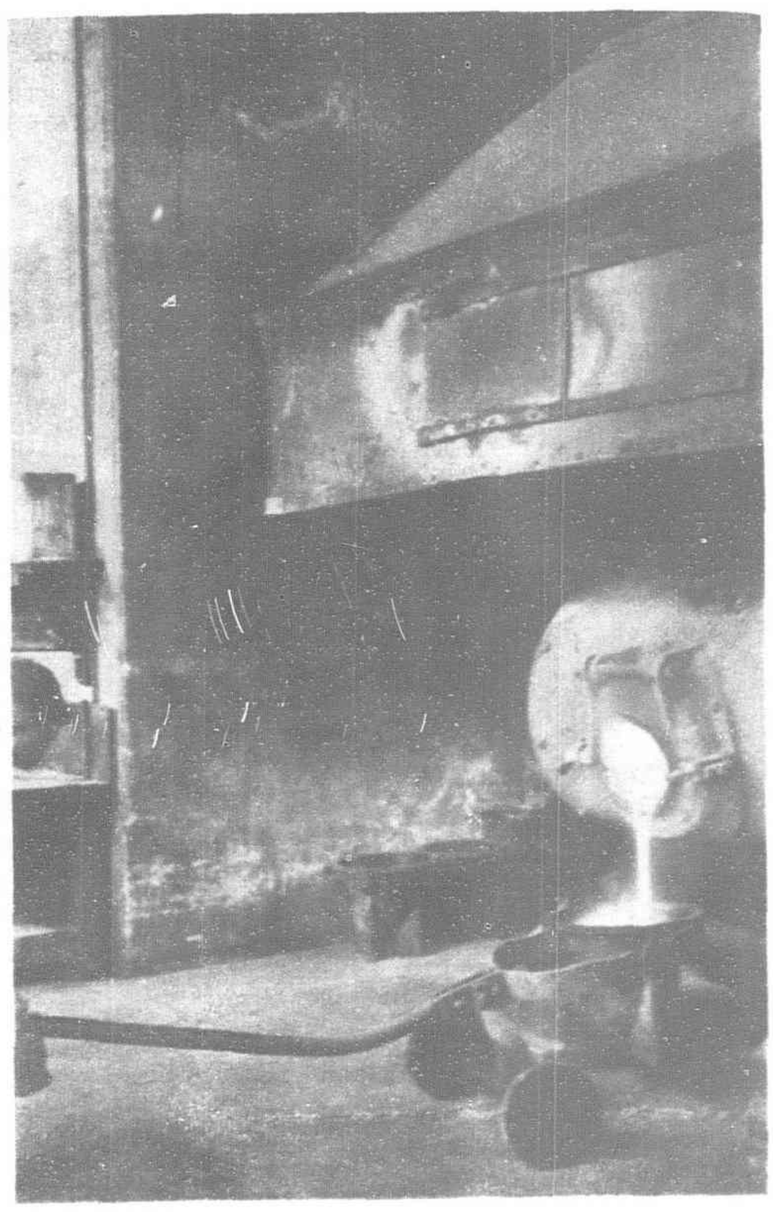
Meal time in the Savage Goldfields. Note handle of the Gangsa (gong); it is a Human Jaw Bone



Each Ingot must be cleaned and polished before it is shipped to the U.S.



About $27,000 worth of Gold in Cones each of which is worth $9,000 U.S. Currency after First Melting



A White Hot Stream of glowing Molten Gold

Some of the gold looks yellow and rich, some of it has the pale tint of silver ; it all has to be assayed and paid for according to its true value as to pure gold contents. For many years Pat Hoover has been trading with the brown man of the hills and they know him too well to try tricking him.

There are a pair of officious looking scales on the desk in Pat Hoover's *bodega*, store room. The hill man weighs all his gold in silver pesos, the currency of Latin American countries. Not all pesos contain exactly the same weight of silver, however. Take for instance one chap I recently saw squatting on the floor of Pat Hoover's office. He was an unostentatious little man, clad only in an old army coat and a gee-string, and he produced from his girdle and his "head basket" a total of at least $2,000 dollars worth of gold. But his measures and Pat's were quite different. He argued that he had weighed his gold carefully. Pat Hoover asked to take a look at his coins. Hesitatingly the hill man once more dived down into his basket and there, wrapped in a dirty piece of paper were seven coins : One eight real from Mexico, 1878 : another from Bolivia, 1855 ; three from Spain, 1789, 1817, 1821 ; one from Peru 1868 ; and lastly a "In God We Trust" U.S. coin. 1889. In the "open market" the Igorotes will be paid an average of $10 to $12 per one peso-weight of gold, while if assayed, the gold may be worth as much as $17.50 to $20.

Now, this Igorot had brought an unusually large quantity of gold and we asked where such a large find had been made. The man refused to tell, of course, but he promised to bring more gold to Hoover in a few weeks time. The interesting feature of this gold was that some of it was in large nuggets ; these are seldom found here. Most of the ore shows only brown, rusty streaks in the "rock." Such gold is called "bronze gold" and it takes an expert to recognize it, while melting or a cyanide test would disclose its presence immediately. "Bronze gold" is in reality a very finely divided gold and has been the undoing of many miners of the olden times. The Igorotes, however, have long known the existence of this gold and they have had their own method of melting it. There are thousands of tunnels bored into the hillsides of Luzon that bear witness of the savage man's mining activities. He still works at most of them. Patiently he and his women will toil for days and weeks, sometimes their labors bringing as little as 30 centavos a day. The men will break the ore, the women will crush the rock and pan the dust. But sometimes their toil is rewarded with a lucky find of a "pocket" of gold worth hundreds if not thousands of dollars. Seldom, very seldom one stumbles across such rich deposits of free gold.

Another Old-Timer

Another American prospector was Charles E. Nathorst, recently retired chief of the Philippine constabulary. He, too, came with the American army of occupation, and in time he, like so many others, decided to try his luck at prospecting. He got along well with the savage natives and in a few weeks time was able to make his first strike. It proved to be a pocket, from which he took out gold worth about $10,000. He liked the mountain country and the people so well, that he enlisted in the insular police force, was detailed to the mountain province and after more than thirty years of service, was promoted to Brigadier-General and Chief of the organization.

Deep down in a valley, between Mount Pulog and Mount Data, close to a river, lies the Igorot village Kabayan. In connection with gold mining in Luzon this village has a reputation all its own. It was from here those fearless, tattooed warriors in the olden days went into the hills in search of gold, animal life and human heads. Had it not been for Henry A. Kamora I would never had seen those dishes, cups, plates, bracelets and anklets, the tribal treasure of the Kabayan people. Kamora is the *Buknon*, chief of his people and a member of the Philippine Legislature. He is a fullfledged Igorot, although a Christian ; he it was who told the men around the *ato* fire to show me the tribal treasure. Hesitating, the men obeyed. Only a few of them know where it is secreted, not even Kamora can touch those sacred, golden vessels and jewels unless it is decided at a meeting of the old men, the councilors around the *ato*. But it had been so long since they had seen them themselves. It was the pride of the tribe. After all, the white *Apo* had not come to buy them or take them away from them, he had come to see them and tell the world in words and pictures of the riches of their people, their achievements, their love of old customs, the story of their wanderings and their adventures in the wilds of the hill land. All this Kamora told them, and one after another they disappeared to presently return with those golden objects entrusted to their care. There were cups as large as finger bowls, there were dishes, twisted anklets, and flat, broad bracelets. There were no ornaments or engravings on them ; it was simple, hammered, savage man's workmanship.

But one thing they would not show me. They would not bring me their sacred, golden hat.

It was only on great occasions that it was exhibited, such as bringing in of a human head, or at the *Cindian cañao*, a tribal feast taking place every five years, nowadays substituting a head

taking celebration. It seemed to me that the only way to see that magic hat would be to arrange a *Cindian canao*, and I mentioned this to a stalwart Igorot warrior, who understood a little English. He at once spread the news among the others and their faces lighted, and there was a general rejoicing.

Kamora, who had been absent for a few minutes, came rushing. He looked worried.

"What is this I hear? Are you promising these men a *cindian*?"

"Good heavens, man. Do you know that it will cost you at least a thousand pesos. Three *carabaos*, water buffaloes, have to be sacrificed, dozens of pigs and hundreds of chicken. There must be unlimited quantities of *tabuy*, rice wine . . . ."

Needless to say, the *cindian* was called off.

An Ancient Tale

It was Kamora, who told me how his great-great-great grandfather, Tagultol, and a party of skilled hunters and fearless warriors went into the hills in search of adventure and gold. In those days peace was a rare thing among the mountain tribes and no man ever ventured alone away from his home village. It was a great distinction for any young warrior to bring home a human head. Only then could he marry, only then was he allowed to sit with the older men around the council fire. When the men came to a place known as Tabio, about twelve miles from Baguio, they spied a wild boar wallowing. They speared it and built a large fire to singe off the boar's hair. Tagultol saw something glimmer in the hair; it was gold dust. The hunters hurried home to Kabayan with the gold tidings.

Tagultol called a meeting of his people and it was decided to stop all mining in Kabayan and thus save the soil for agricultural purposes, while those who wished to mine were to move to Tabio where the gold has proven so plentiful. Here they could take to hunting when tired of mining. The gold at Tabio actually proved to be unusually rich, and Tagultol and his son Dagul made for their women twelve pairs of bracelets and six pairs of anklets, while their slaves were put to work on those cups, some of which I had seen. Each cup weighed five and a half peso-weight. When this was done, Tagultol told his son that he wanted to make something his descendant would remember him by, and he ordered his slaves to hammer three hats of solid gold. Each one was to weigh forty-five peso-weights, or according to the present gold values each was worth about $800.

It was while working at the Tabio mine that the men were discovered by the Spaniards. The soldiers took them by surprise and the tribesmen fought them, but they were overpowered and at length peace was declared between them and the Spanish. However, the crafty Spaniards soon found out about the gold treasure of Tagultol and persecuted him and his family until he gave up part of his treasure, among which were two of the hats.

The work at Tabio still goes on. Deep, narrow tunnels have been cut with primitive tools by the tribesmen many hundred feet into the hill side, always following that white, gold bearing vein. At places it has become so narrow that only the small hill men can squeeze through. No full grown white man could ever pass here. Still, the Igorotes plod along, working in the suffocating smoke from their torches, carrying basket upon basket of ore to be crushed and panned by their women outside. All mining is strictly communal. Every man is supposed to do his share. The white man's maxim "finding is keeping" is non-existent. When at last the ore is melted and sent down to Baguio by a trusted messenger, the miners know that they will not be cheated in the division of the proceeds. Because cheating among the tribesmen does not exist; the tribal law has only one penalty for it, and one can be reasonably sure that it is executed without the authorities ever hearing of it.

* * *

There are at present three gold mines working full blast day and night in the Baguio mineral region: Antimok, belonging to the Benguet Consolidated Mining Co; Balatoc of the Balatoc Mining Co; and Itogon, of the Itogon Mining Company. Of these the Antimok mine is the oldest, it has been plodding along through various successes and failures for more than twenty years. It is now paying heavy dividends. Balatoc Mining Company was organized only a few years ago; the financial returns have been very good. Itogon Mine is also working at a nice profit. In time I visited all three of these mines; they all use the same processess of extracting gold from the rock, the cyanide method. To me, the Balatoc mine was of greatest interest, because, closely connected with its discovery and development, there is so much lore, stirring tales of sorcery, and feuds.

Richest in World

Very little is authentically known of the earliest development of Balatoc. To-day it is one of the richest mines in the world. It has been assumed that it was worked at some early date by Chinese. Some Igorotes maintain that it has been worked as far back as six hundred years ago. Representative Kamora insists upon that it was one of his headhunting forefathers, one of the men of Tabio, who discovered the gold at Akupan—as the place was known among the tribesmen. Later it was given the name Balatoc; translated, it means "Gold."

Dressed in miner's rough clothes and led by two of the mine officials, the author dived into the dark tunnels of Balatoc, deep under the top of the hill. They called it "1,500 level," which, I presume, meant that we were crawling along that many feet below the hill-top. Ahead of us we could see dim lights moving to and fro: miners at work. Occasionally an electric ore train rattled noisily by. Water was dripping from the ceiling and the sides, rivulets of opaque water ran along the tunnel tracks. However, at some places this water looked clear and inviting. Dripping with perspiration it was good to see it bubble right out of the rock, but I was stopped from drinking it. Water and pyrites form sulphuric acid: not strong enough to kill but decidedly unhealthy to drink.

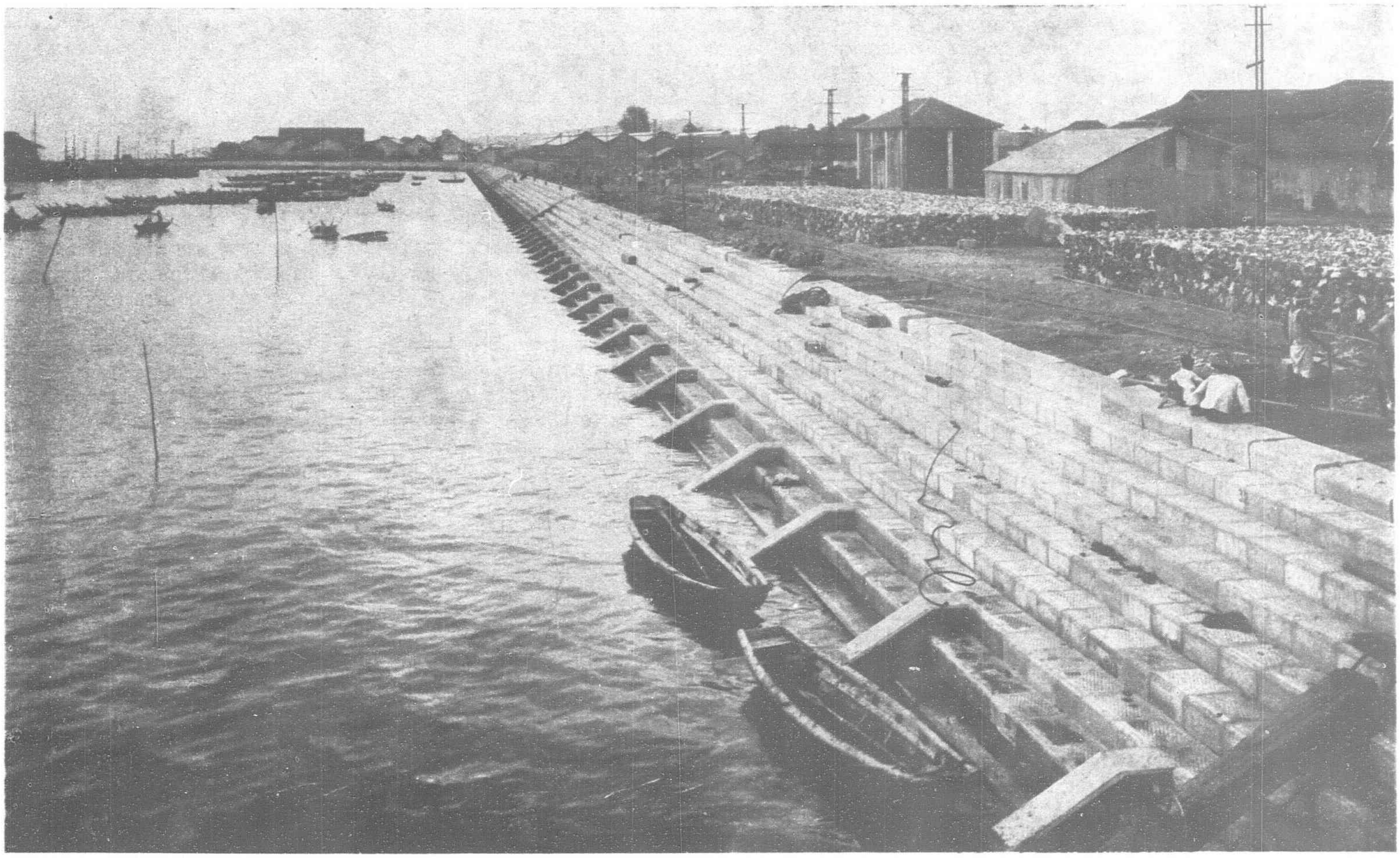
Within these "bowels of the earth" about six hundred Igorotes work day and night. Their wages are about one peso and fifty centavos a day, which is considered "normal" according to Philippine standards. In addition to their wages they have free living quarters, and in case of illness they are entitled to free medicine and hospital care. According to Mr. G. J. Montague, one of the officials,—his official title is Mine Superintendent—the Igorotes are hardy, cheerful and un-complaining. To them "mining is joy." But being savages, anything can happen, at any time. Laborers of warring factions will not work in the same tunnel. Not long ago the cook of the "American mess" was found killed with his ears cut off. Some tribes are satisfied to take only the ears of their victims, when it is impracticable to take the whole head. The authorities knew, of course, where to look for their man, and they arrested him. He proudly admitted his deed; he had done it for the sake of his sweetheart, who had hitherto refused to "accept" him. Now he had proved himself to be a man and worthy of her.

The Igorot miners are very superstitious. They are constantly on the look out for omen, whether good or bad. They firmly believe in prowling *anitos*, spirits, and very little is needed to start a general stampede; no coaxing will persuade them to return to work until the causes of the *anito's* appearance or displeasure have been removed and sacrifices made.

Once one of the laborers suddenly became ill while working at a slope in one of the tunnels. He was promptly carried out, and attended to, but it soon became evident that he would not live. Word was sent to the young man's father in a distant village. The old man hurried to the bedside of his dying son. He took one look at the boy and then hurried out. He procured a white chicken and with the bird under his arm he rushed to Mr. Montague's office. When he emerged from it he looked pleased. He said to Mr. Montague that now he was certain of his boy's recovery as he had received the superintendent's permission to offer a sacrifice to the bad *anito* that had caused his son's illness.

Interested the mine superintendent went along. After a while the old man asked to be shown the exact spot where the boy had been taken ill. He was led to the place. There he went down on his knees and began to mumble prayers. Several times, kneeling and standing he proffered the chicken in all four directions. At last he produced a knife. With a cunning grin on his face—he was going to fool the *anito*—the old man only made two incisions in the breast of the bird, and holding it in front of him, he invited the *anito* to enter the bleeding body of the chicken. Suddenly his voice and manners changed into a shrill command. Then,

(*Continued on page 143*).



A view of the completed Telok Ayer Tidal Basin Project

Singapore Port Development

Great Engineering Difficulties at Length Overcome in Completing the Telok Ayer Tidal Basin Project

By R. H. STEED, Executive Engineer Marine Public Works Department, Singapore

It is of interest to note that the first proposals for the reclamation of the foreshore at Telok Ayer were dealt with in the year 1865 by General Cavanah, the last of the Governors under the Indian régime.

At this time the foreshore line forming Telok Ayer started from the old Prince's battery, on the site of the Ocean Building, Collyer Quay, ran close to the godowns in Malacca Street, followed Telok Ayer Street and skirted Prince Edward Road to the foot of Mount Palmer. At low water the whole of this area was a swamp which had become the receptacle of much of the drainage and garbage of the town.

Two proposals were put forward, but for some reason or another, both schemes, for a time at least, were dropped. In 1872, the question of Telok Ayer was again discussed in commercial circles and in the Legislative Council. Detailed plans and estimates for a scheme were prepared and was approved by the Secretary of State, but this was eventually laid aside. In 1879, Sir William Robinson, submitted a proposal to the Secretary of State, to carry a road across Telok Ayer, thereby connecting the new harbor to the Town of Singapore and to reclaim the areas between the causeway and the mainland. On June 10, 1879, the Secretary of State, Sir Michael Hicks Beach, gave his authority to carry out the scheme.

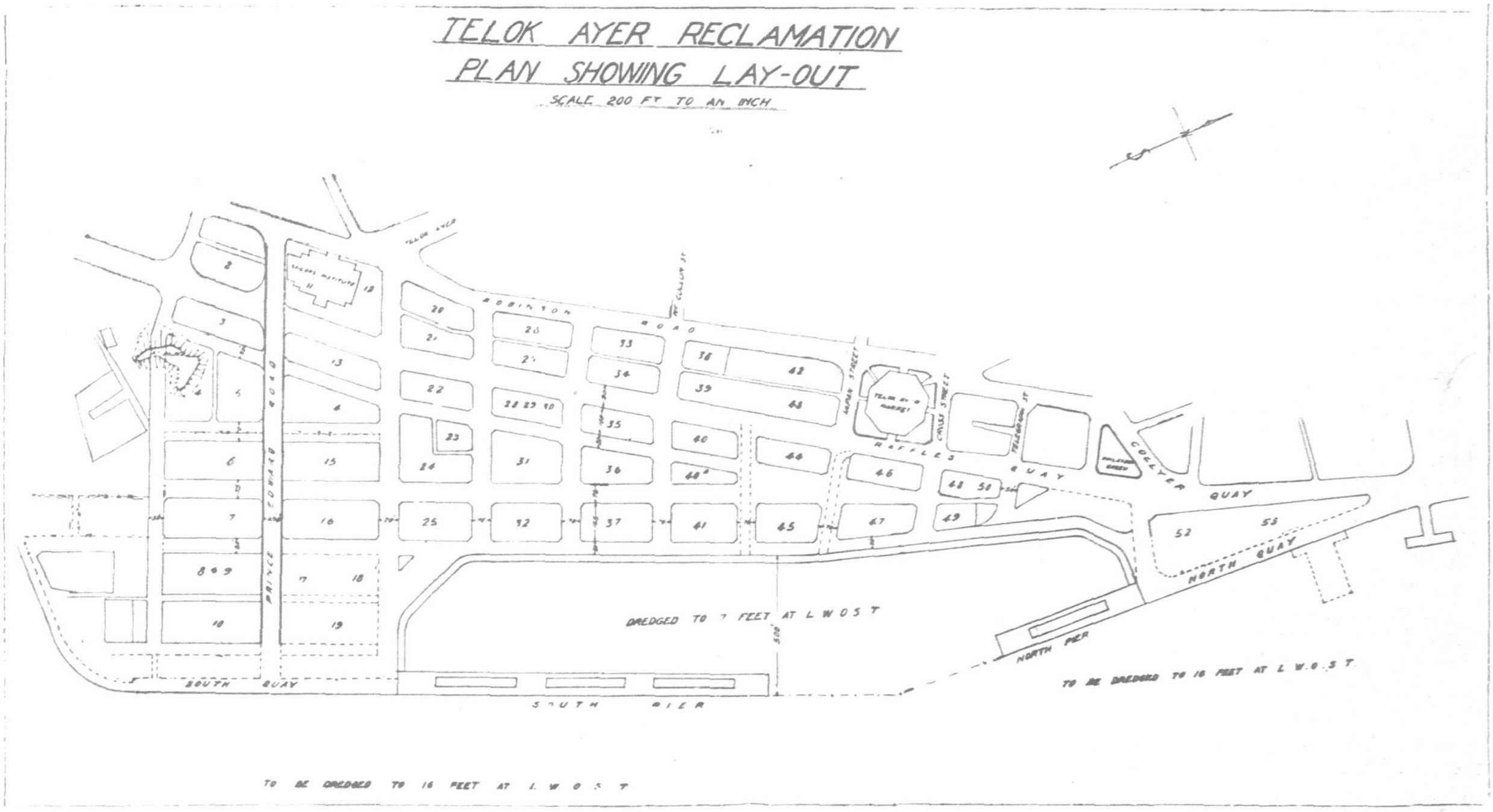
Work commenced the same year in accordance with the design prepared by Colonel McNair, Colonial Engineer, at an estimated cost of $349,650. The scheme provided for the removal of 500,000 cubic yards of earth from Mount Palmer and for the construction of a sea wall across the entrance, whilst the bay was being filled up. The work took some years and many difficulties were encountered. In 1885 when work was nearing completion, a portion of the reclamation near Collyer Quay, sank without any ostensible reason, there being no inordinate tide, rain, nor sea to which cause the subsidence could be traced. The occurence caused considerable anxiety.

At the time, Sir John Coode, then in Singapore, was asked to examine the works in progress along the sea frontage. He advised that the front line should be advanced towards the sea a further eighty yards, and to form an enbankment of rough rubble. The alignment of this protective enbankment and its behavior under monsoon weather formed the subject of subsequent reports, but finally in 1887 it was agreed that the enbankment shall be constructed on a line extending from d'Almeida pier at the South end of Collyer Quay to Mount Palmer, the present position of Raffles Quay and Raffles Street.

The reclamation of the larger area was continued over a number of years and considerably more trouble was experienced. In 1891, 300 feet of this Reclamation subsided and in the following year the weighted bank in front of the reclamation disappeared, thus loosing 4,000 cubic yards of stone, and forming a dangerous hole.

In 1896, completion of the main work was reported at a cost of $917,243.84, but it was found necessary to expend a further $54,447.10 in raising and repairing damages caused by the subsidence of the ground, since this area was by no means stabilized.

In all, 2,436,522 square feet of land (56 acres) had been reclaimed at a cost of $971,690 or .40 cents per square foot, and in 1906 the sum of $1,408,542 had been realized from the sale of 756,000 square feet of land, approximately ⅓rd of the area reclaimed, at an average cost of $1.84 per square foot which showed a profit of $437,000.



In 1901, public opinion was expressed regarding the necessity for the construction of a boat harbor to relieve the congested condition of the Singapore river. Messrs Coode, Son & Matthews were asked to submit a scheme, and they eventually recommended the construction of a breakwater totalling 13,030 feet in length. This was superseded by a proposal for the construction of a basin having an area of 270 acres, sheltered by an inner breakwater of nearly one mile in length, with a quay for berthing of coastal steamers, tongkangs, twakows, etc. It was originally intended that the quay wall shall be 4,700 feet long with a depth of water alongside of 16 feet L.W.O.S.T. In 1907, a contract to construct some of these works was let to Sir John Jackson, Ltd.

The construction of the quay was commenced from either end, but it was found that near the center the mud was so deep that the cost of sinking cylinders became uneconomical and as a result, after an investigation was made by a committee of Engineers, it was decided to amend the scheme.

Their report was issued in March 1911, and in accordance with their recommendations the incompleted length of 850 feet of quay wall between the north and south ends of the completed wall was omitted. This gap, they recommended, should form the entrance to a tidal basin which should be formed behind the quay, with stepped slopes suitable for lighter and tongkang traffic.

In the year 1917 and 1918, settlement in the reclamation was found to be negligible in most instances. It was therefore suggested that a test of the material in the banks should be made by dredging in the basin in front of the reclamation and as a member of the staff of Messrs. Coode, Son & Matthews was in Singapore investigating the Singapore River Problem he was invited to carry out the test of experimental dredging.

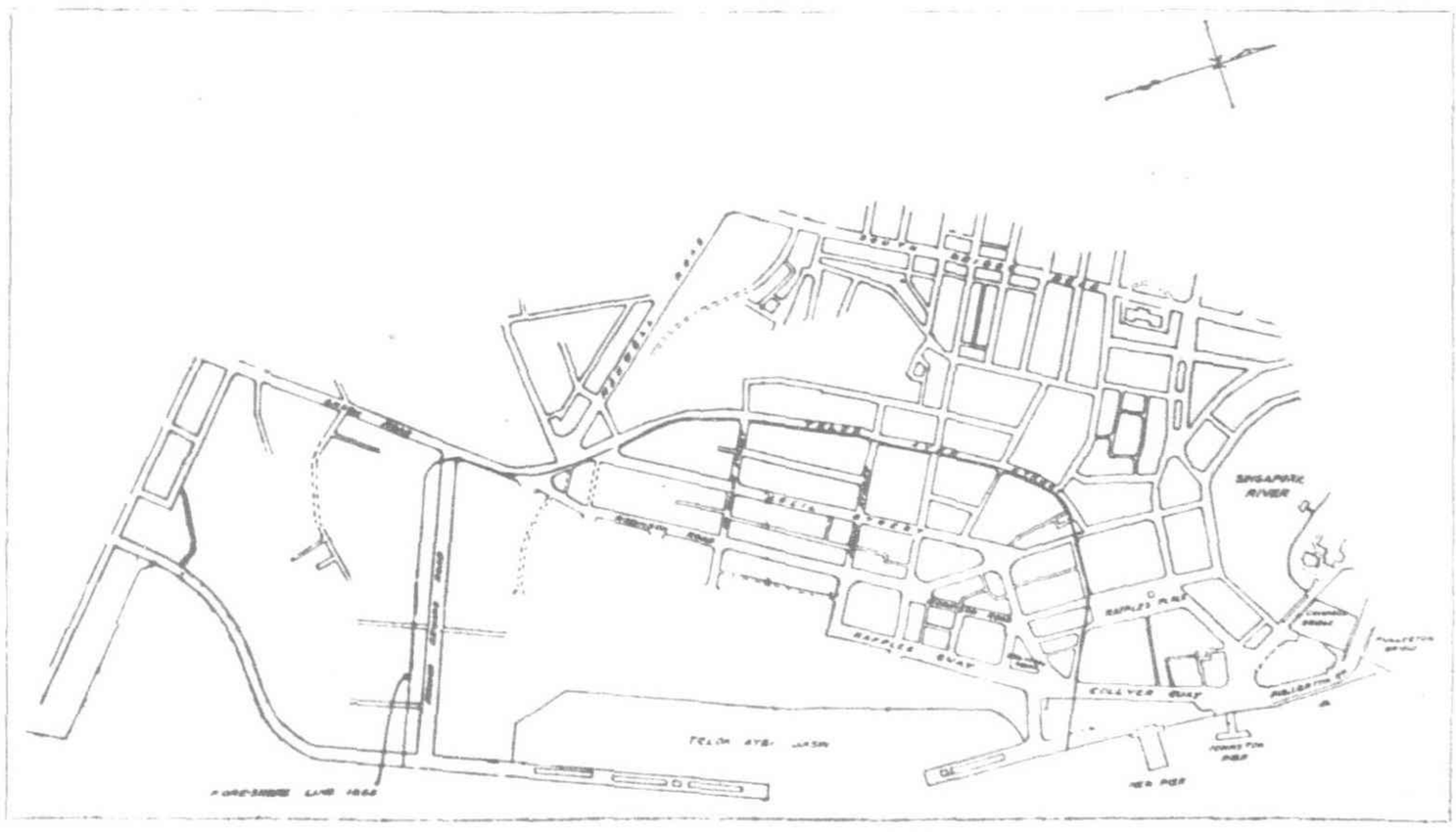
The first concrete proposal for the completion of the Basin Scheme is, however, contained in the report from Messrs. Coode. Fitzmaurice, Wilson and Mitchell dated September 21, 1920. In it, recommendations were made for careful dredging in the basin to a maximum depth of 7 feet L.W.O.S.T. and the construction of a stepped or sloped sea wall round it. The Committee dealing with it at the time decided not to proceed at the time owing to the cost which was thus estimated at $5,000,000.

In 1929 the scheme was approved by Government and plans based on the proposals of the Consulting Engineer and embodying improvements in the designs of the piling anchors, etc., were drawn up. The revised estimate of cost of the scheme was $2,200,000.

Messrs. Gammon (Malaya), Ltd., were the successful tenderers for the construction and the Contract was signed in May, 1930. The work was successfully completed in June, 1932.

The length of the wall was 3,077 lineal feet and cost $355.53 per lineal foot.

Construction.—The wall was constructed under the cover of a cofferdam, consisting of a timber staging and interlocking steel sheet piles driven on the sea side. Larrsen steel sheet piling No. 1 Section weighing 25½ lbs. per foot and 25-ft. long were used throughout and were driven and drawn on seven occasions.



Scale 8 chains to an inch

The extracting of the piles proved very satisfactory and gave little trouble. Each Section of dam was between 300-400 feet in length. Work proceeded in two sections simultaneously.

Toe Cap. — After closing the cofferdam and pumping dry, excavation was carried out for the toe cap to—4.50-ft. The driving of he 14-in. by 14-in. R.C. piles for the toe-cap was then proceeded with. The lengths of these piles vary from 20-ft.-78-ft., and were driven to a set of not less than 2-in. for 10

blows with a 2½ ton monkey dropping two feet. Following the driving of the toe-cap piles, R. C. slabs were driven behind the shore side piles for a depth of 12-ft. This depth varied according to the ground. Simultaneously to the driving of the toe-cap piles, the excavation for the anchor piles and anchor cables was carried out. The toe-cap concrete was then placed. A 9-in. diam. C.I. pipe was set every 15 feet along the length of the toe-cap, in order that the anchor cable could be fixed to the toe-cap.

ANCHORS. — After the driving of the anchor piles, the anchor cable was placed and fixed into position, and screwed up taut by means of the "U" bolt in the toe-cap. The anchor cap concrete was then placed and after 48 hours the cable was again tightened to take up any slack. The steel cable was 4½-in. circumference and consisted of six strands, each 19 wires, and weighed 20½ lbs. per fathom. The cable was protected before fixing by painting with hot asphalt, then one layer of ⅜-in. diam. coil rope, and finally covered with jute cloth wired on. Hot asphalt was applied after each stage. When the cable had been drawn up taut boiling asphalt was poured into the C.I. pipes at the toe-cap and anchor-cap, thus sealing the ends of the cables; the ends of the "U" bolts were cut off and the recess concreted up.

CORAL BACKING AND BLOCKS.—As soon as the anchors were completed excavation was carried out behind the toe-cap and the coral-backing placed into position, the whole being hand-packed and stepped to receive the pre-cast concrete blocks. The blocks were then set, and finally the joints pointed. The inclination of the wall is 30.° Mass concrete 3-ft. wide and 2-ft. 3-in. deep was placed behind the granite cope.

RAMPS.—At 15-ft. 0-in. intervals along the wall from the toe-cap to + 7.00-ft., R.C. ramps were constructed, to prevent any floating craft from sitting on the wall.

At the end of each section, the steel sheet piling was left in and finally cut off to step level and concreted in.

CONCRETE.—Concrete for piles and slabs ¾-in. granite

Ferrocrete cement Mixture 3 : 1½ : 1.

Concrete for toe-cap, anchor cap and ramps

1½-in. granite Blue Clock cement mixture 3 : 1½ : 1

Concrete for pre-cast blocks. 1-in. granite,

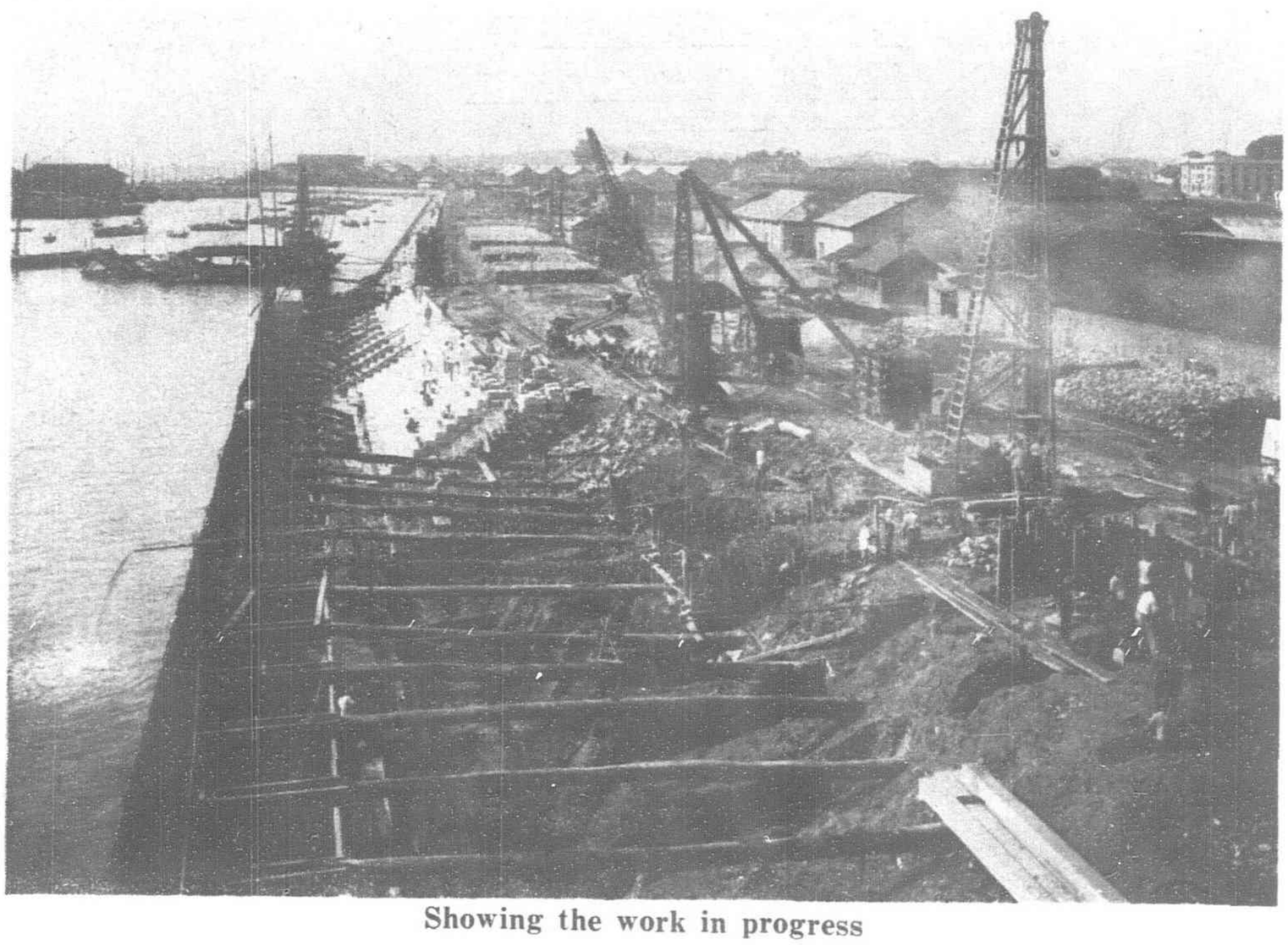
Blue Clock cement mixture 3 : 1½ : 1.

DREDGING. — During 1930, both the *Tembakul* dipper dredge *Todak* were engaged in dredging operations. During 1931 and the first half of 1932, the *Tembakul* has been dredging within the basin and also on the east side of the north and south piers. It is estimated that 438,076 cubic yards of dredgings and silt have been removed from within the Basin since October, 1929, completing the whole area of 23 acres within the Basin.

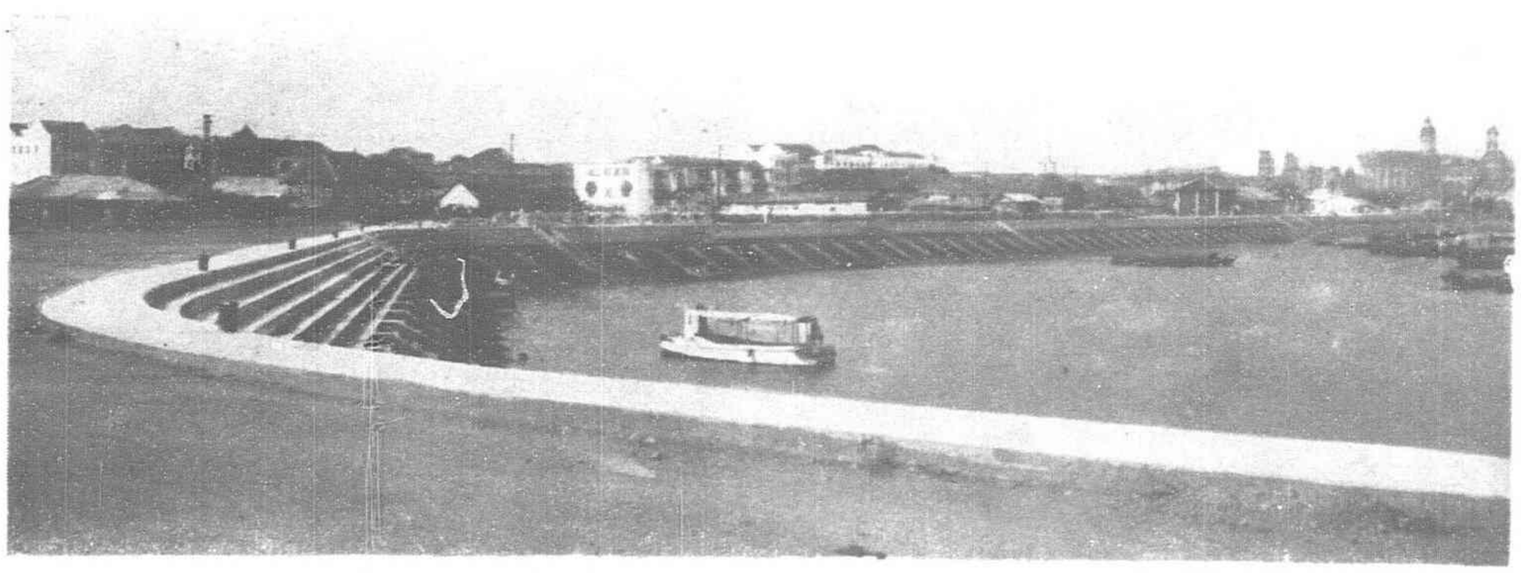
The area on the east side of the south pier has been successfully dredged to −11.00.

This area and also on the east side of the north pier will eventually be dredged to −16.00.

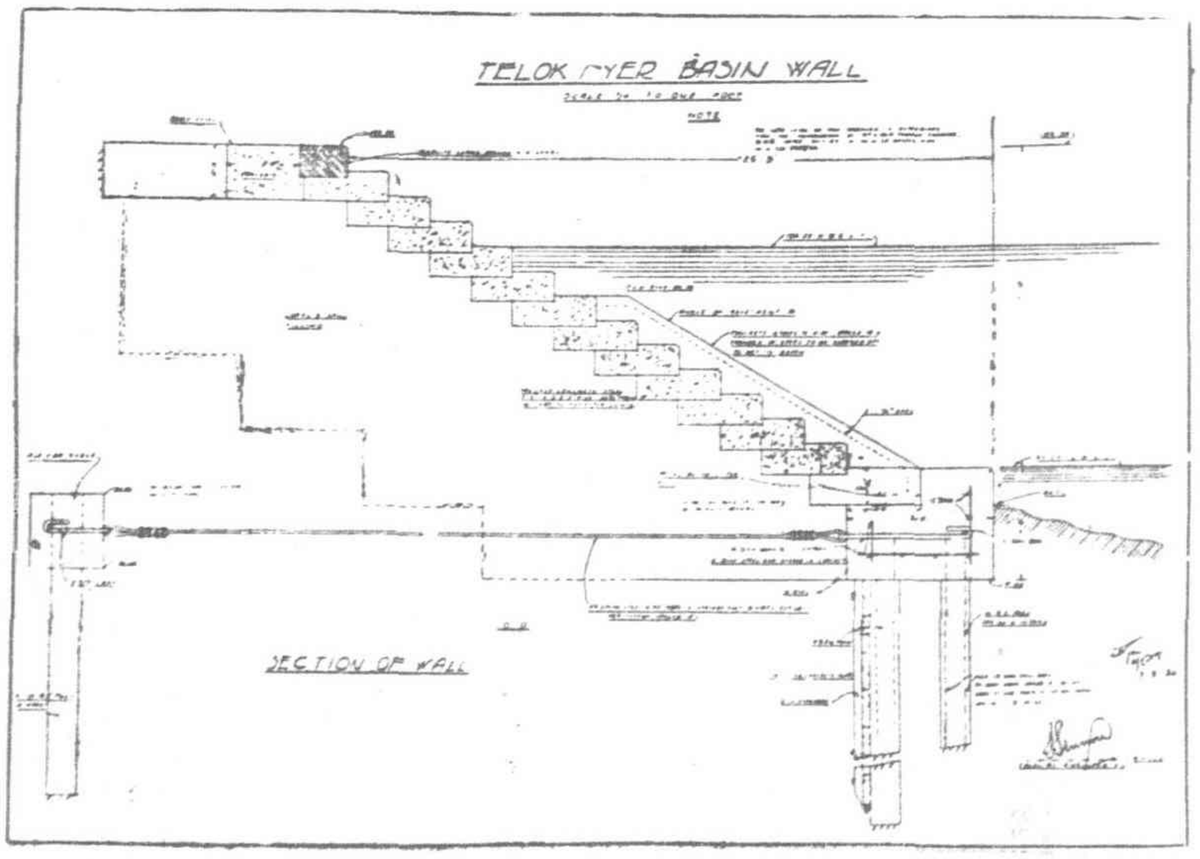
During the whole of the dredging operations both inside the Basin and outside strict observations have discovered no movement in either North or South Piers.

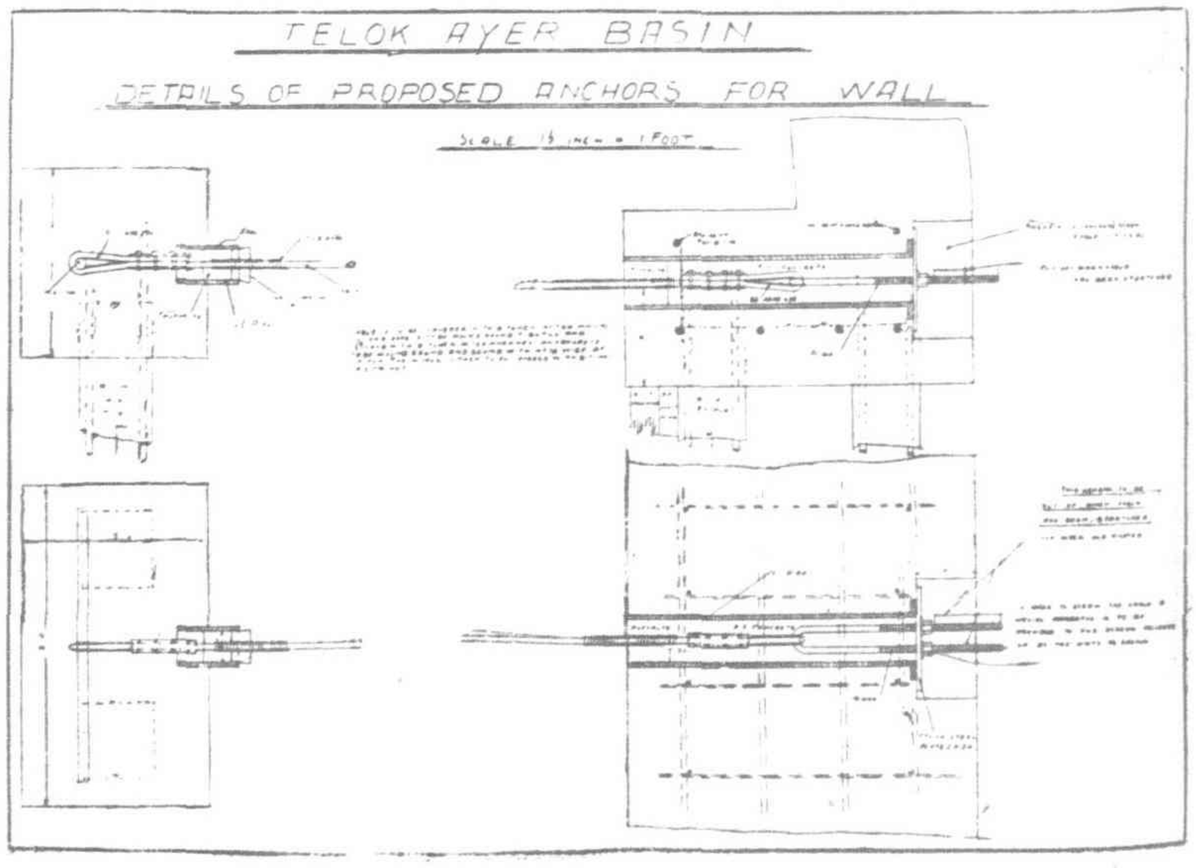


Showing the work in progress



Another view of the Basin





Large Heavy-Duty Plano-Milling Machine Is Sold to Japan*

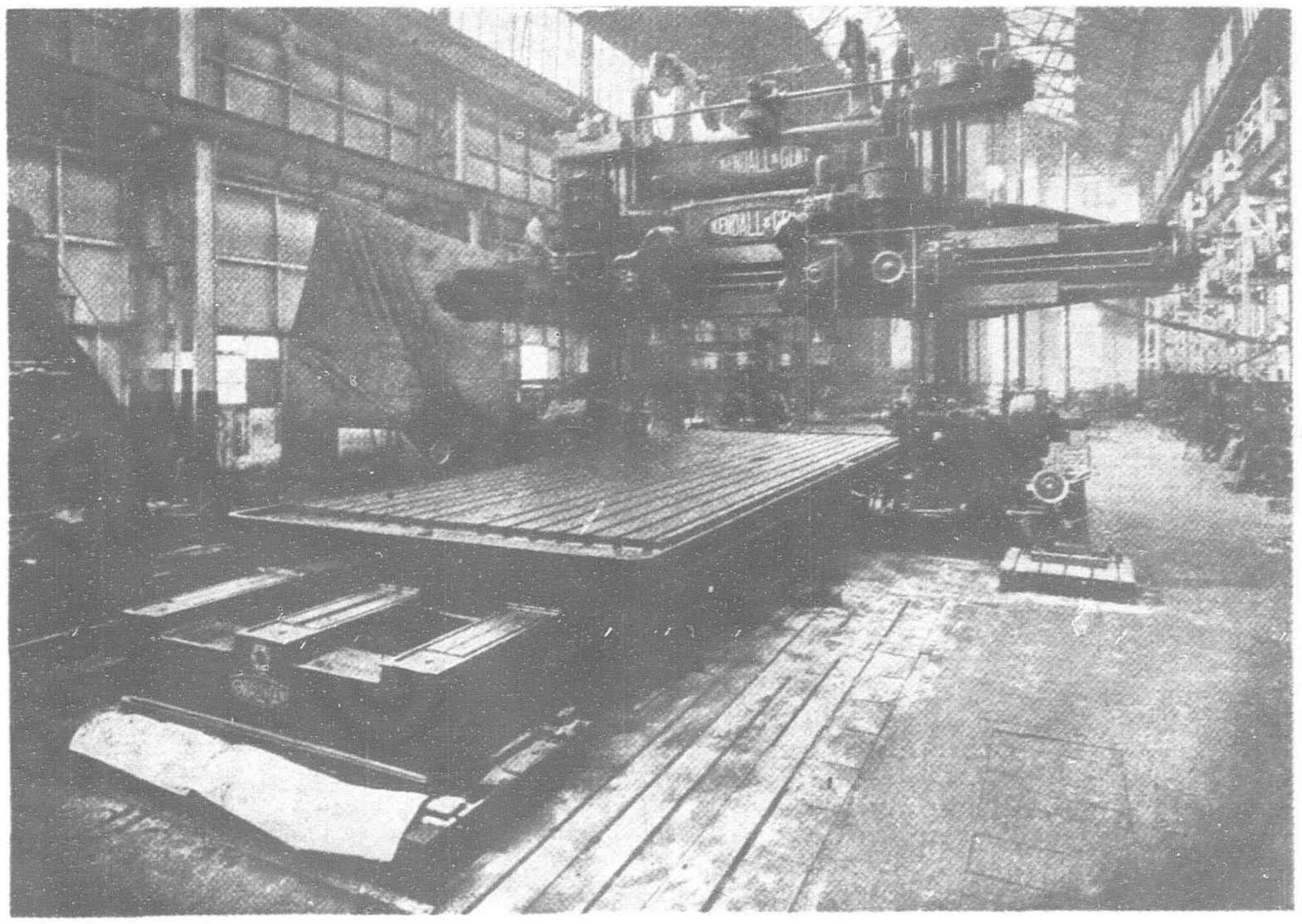


Fig. 1.—A general view of the Milling Machine which gives some idea of its massive proportions

THE accurate machining of heavy castings and components for large Diesel engines, locomotives and similar work has generally presented many difficulties due to the necessity of re-setting the work-piece a number of times on machines which are either not of a suitable size nor adequately equipped to deal with the machining operations in a straightforward manner with a minimum of idle time.

The machine we are now able to illustrate and describe is intended for the use of the Imperial Japanese Navy, and provides a complete solution to these problems. It is, we believe, the largest of its type to be built in Great Britain. Made by Kendall and Gent (1920), Ltd., of Manchester, it enables all kinds of the heaviest plano-milling work to be handled with comparative ease, a great saving in production time and to a high degree of accuracy.

The remarkable outputs to be obtained on this machine are mainly due to the universal character of the general motions and other features, particularly when in operation on work which calls for the simultaneous use of the multiple heads.

The machine has a capacity for machining work 12-ft. wide, 8-ft. high by 28-ft. long, and is provided with four spindles, viz., two vertical on the cross slide and one on each upright, the left-hand vertical spindle and left-hand horizontal spindle being arranged to swivel 20 deg. each side the center line.

Fig. 1 shows a general view of the machine and gives a good idea of its massive proportions and simplicity of controls. The bed, which is 53-ft. long, is of close-grained cast iron of box section, resting on the foundation the whole length. Accurately machined flat slides are provided to receive the table, with special troughs to collect surplus lubricating oils from the slides.

The table is 12-ft. 6-in. wide overall and of special deep section, well ribbed so as to prevent any deflection when carrying heavy loads. The slides for mounting on the bed have three sliding ways which are provided with spirally cut oil grooves to ensure the oil being evenly distributed and so reduce frictional resistance; the tee slots for holding the work are cut from the solid.

Hand and variable self-acting reversible feed motion is provided together with quick power traverse for setting purposes. The motion to the table is transmitted by long twin worms engaging with semicircular racks (see Fig. 2), the end thrusts being taken by heavy ball washers. The racks and worms are cast in special moulds, which produce exceptionally close-grained castings of high tensile strength.

The controls for the table movement are situated on each side of the machine in convenient positions for the operator.

The uprights which carry the cross slide and horizontal saddles are of massive proportions with broad bases resting on the foundation, securely bolted to the sides of the bed and connected at the top by a cross stay. The vertical slides on which the cross slide and saddles move have broad and accurately machined surfaces.

* *Eastern Engineering and Commerce.*

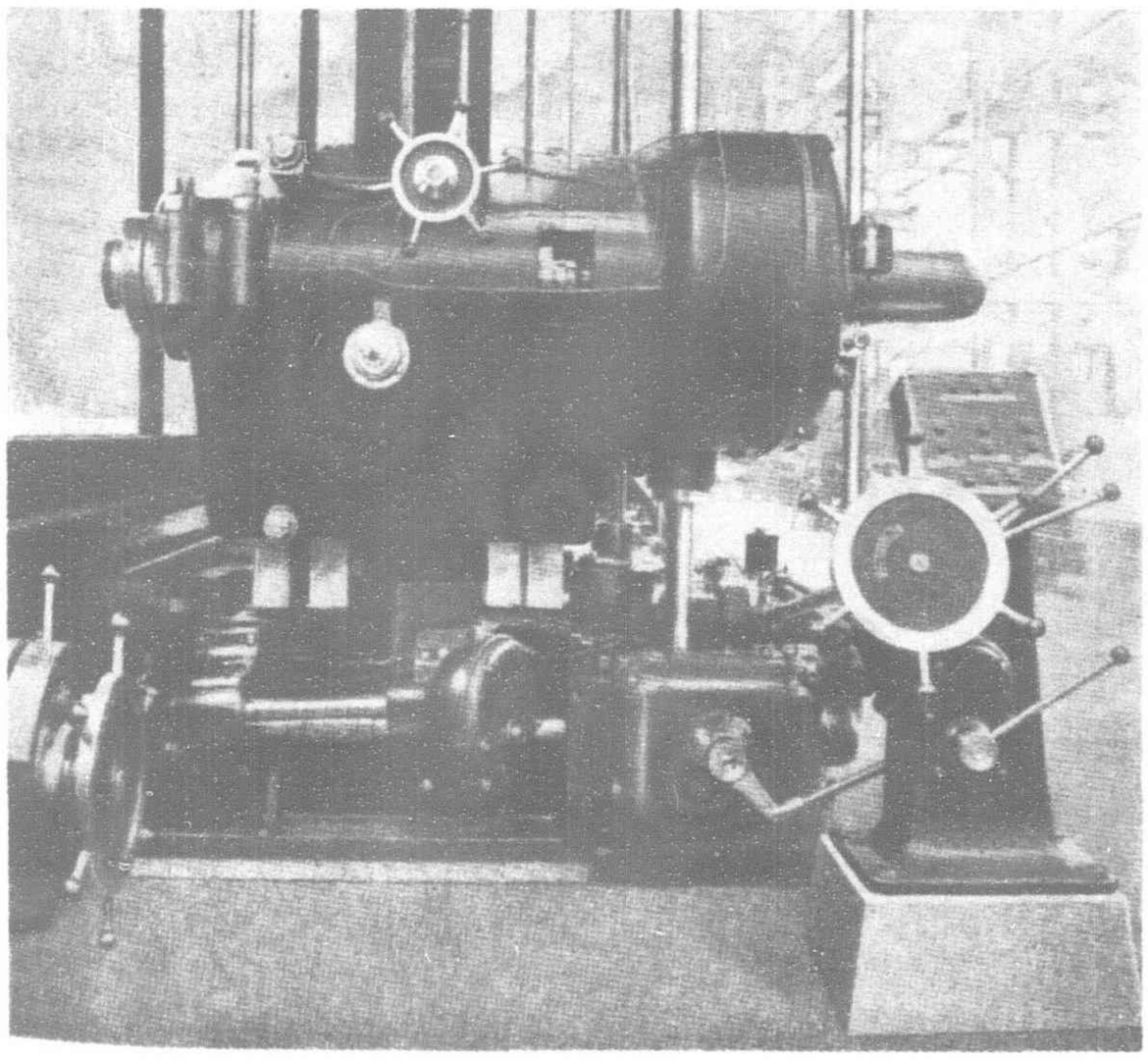


Fig. 2.—A Close-up view of the Control Gear and Operating Panel, also the Right Hand Horizontal Saddle

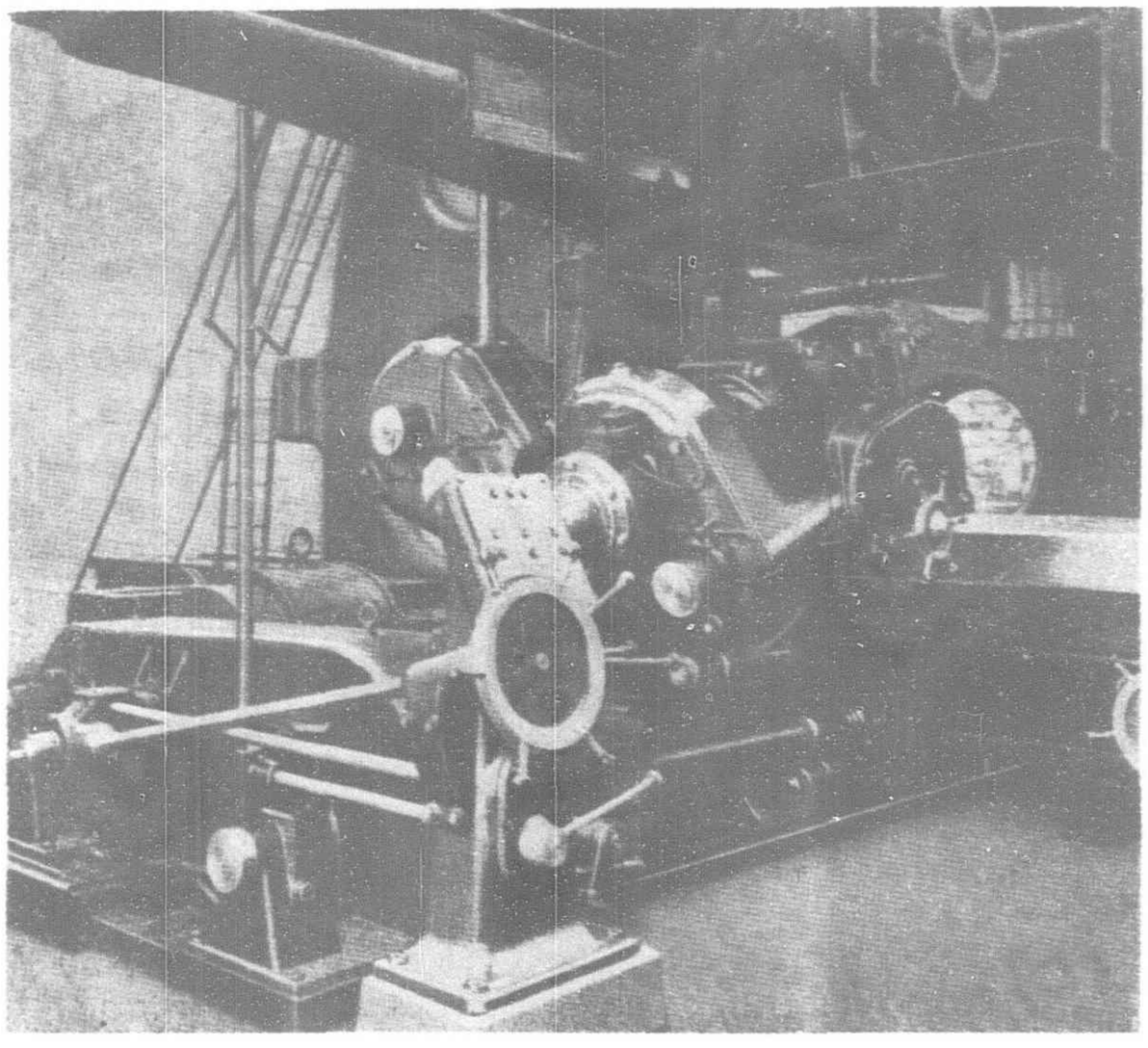


Fig. 3.—The Left Hand side of the Machine with Horizontal Saddle in an angular pasition. The Control Panel is also seen

The cross slide, which is elevated by a 7 h.p. reversible motor mounted on the cross stay at the top of the machine, is of special deep section and designed to prevent any deflection when the two vertical saddles are working in the center of the machine. In addition, the cross slide is partly balanced to ensure easy manipulation.

To obviate any possibility of the cross slide becoming out of true, due to undue wear on the elevating screws, a compensating clutch is provided on the horizontal shaft at the top of the machine.

The vertical saddles on the cross slide are provided with hand and variable self-acting reversible feed motion together with rapid traverse for setting purposes, the controls of which are operated from the platform without the operator having to leave the work. The left-hand vertical saddle is arranged to swivel 20 deg. each side of perpendicular, enabling work having angular faces to be machined without resetting. The driving motion to the spindles is obtained by separate motors of 30 h.p. having a speed variation of four to one coupled direct by steel gearing to each spindle.

The horizontal saddles, which are mounted on the uprights, are balanced and fitted with hand and variable self-acting reversible feed motions vertically, together with rapid traverse for setting. These saddles may be traversed independently or simultaneously, as desired, while the saddle on the left-hand upright can be swivelled 20 deg. each side of the horizontal (see Figs. 3 and 4).

The main driving motion is obtained by a 60 h.p. variable speed motor situated on the left side of the machine, having a speed variation of four to one and coupled to the right-and left-hand saddles by Texrope drive, substantial shafts and gearing (see Fig. 5).

The spindles are of heat-treated high tensile steel running in adjustable conical gun-metal bearings, the front bearings being carried in a steel sleeve, which is provided with a fine adjustment

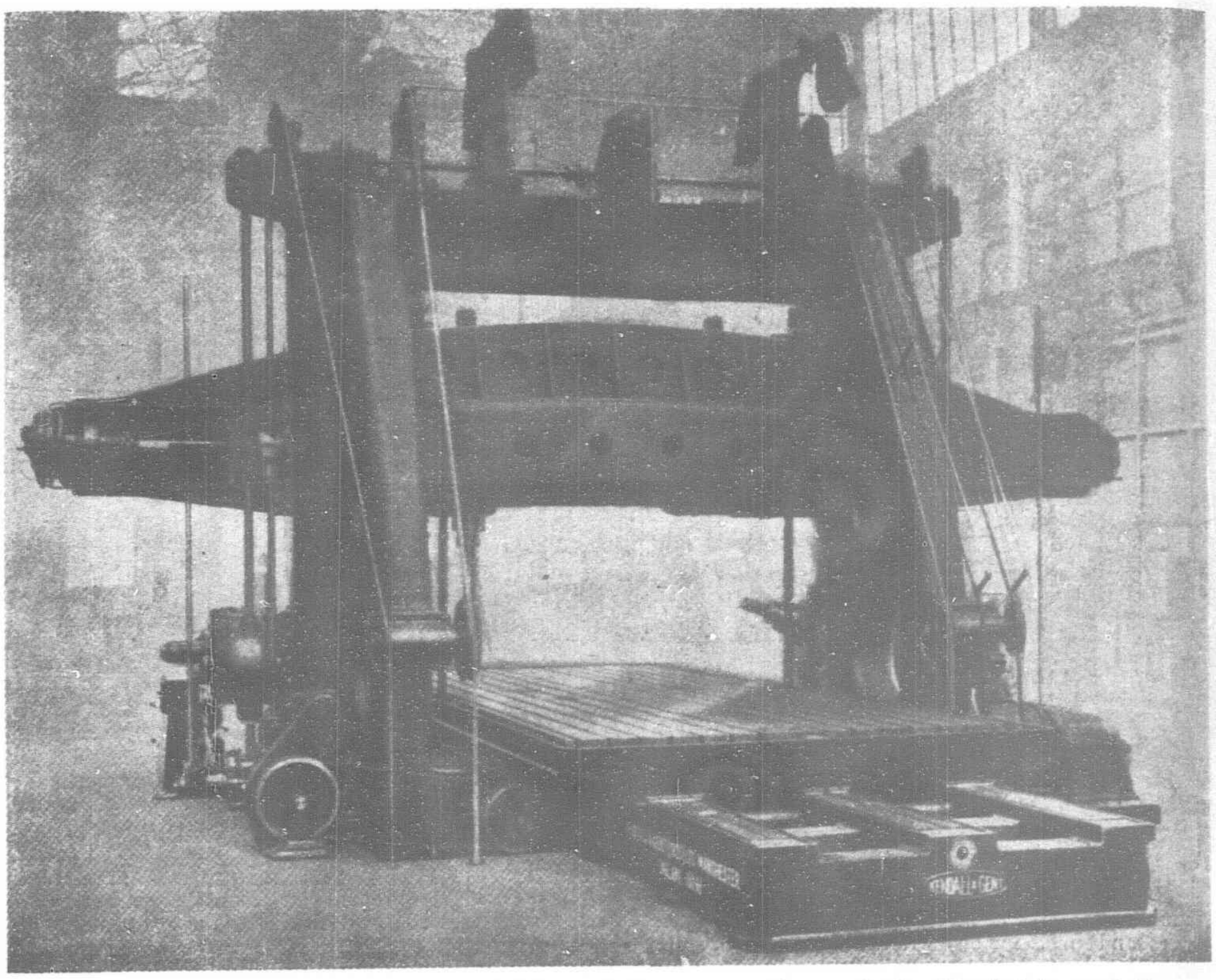


Fig. 5.—Rear view, giving a good idea of the proportions of the Uprights and Cross Slide which carry the Vertical Saddles

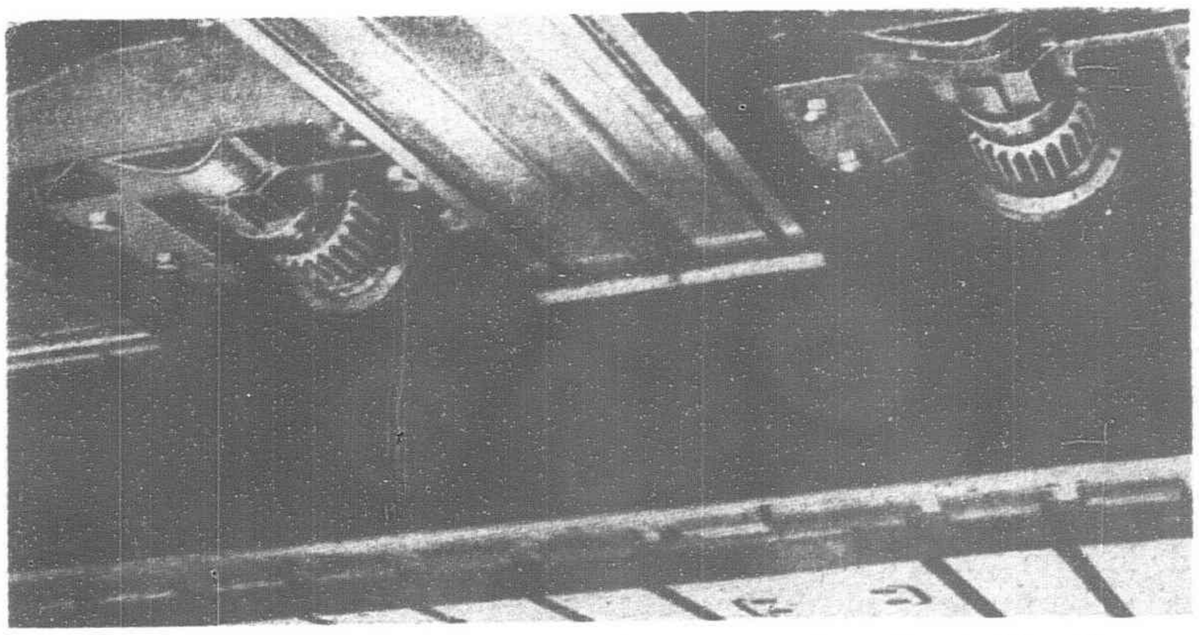


Fig. 4.—The Twin Worm Drive for traversing the table along the bed

for putting on the cut by means of a worm wheel, rack and pinion; the casting is closed firmly on the sleeve by efficient locking bolts, making the sleeve practically solid with the saddle. The spindle noses have a recess for receiving the cutters or mandrels, the drive being provided by flats on the collar, while large face cutters are mounted direct on to the flange on the spindle.

The feed motions to the table and saddles are obtained by a 20 h.p. reversible motor coupled by Texrope drive to a gear box having hardened steel gearing mounted on splined shafts and running in oil, giving nine correctly graduated feeds to each spindle speed (see Fig. 6). All power feeds and traverse motions may be operated independently or simultaneously, by means of conveniently placed levers and push-button switches from the operator's normal working position on each side of the machine. This arrangement is, of course, very useful and necessary on a machine of this size and weight, and enables a continually high output to be maintained without any undue fatigue to the operator.

Lubrication of the various units has received very careful attention; where possible, splash lubrication has been adopted, and elsewhere the Enot "one shot" system has been employed.

The electrical equipment was supplied by Metropolitan-Vickers Electrical Co., Ltd. The motors are of robust design, tested to withstand the arduous and severe conditions under which they will be required to operate.

The control panels are of the well-known contactor type embodying special interlocking devices governing the panel control for the feed motor. In the event of any spindle of the machine stopping, the feed motor is automatically cut out, thus preventing any damage to the milling cutters. It is also impossible to operate the feed motions without first starting the spindle required for the particular operation in hand.

When, however, the table and saddles are required to move for setting purposes, a special change-over switch may be operated, enabling these motions to be carried out. The push-button controls are also placed on points most convenient for the operation of the

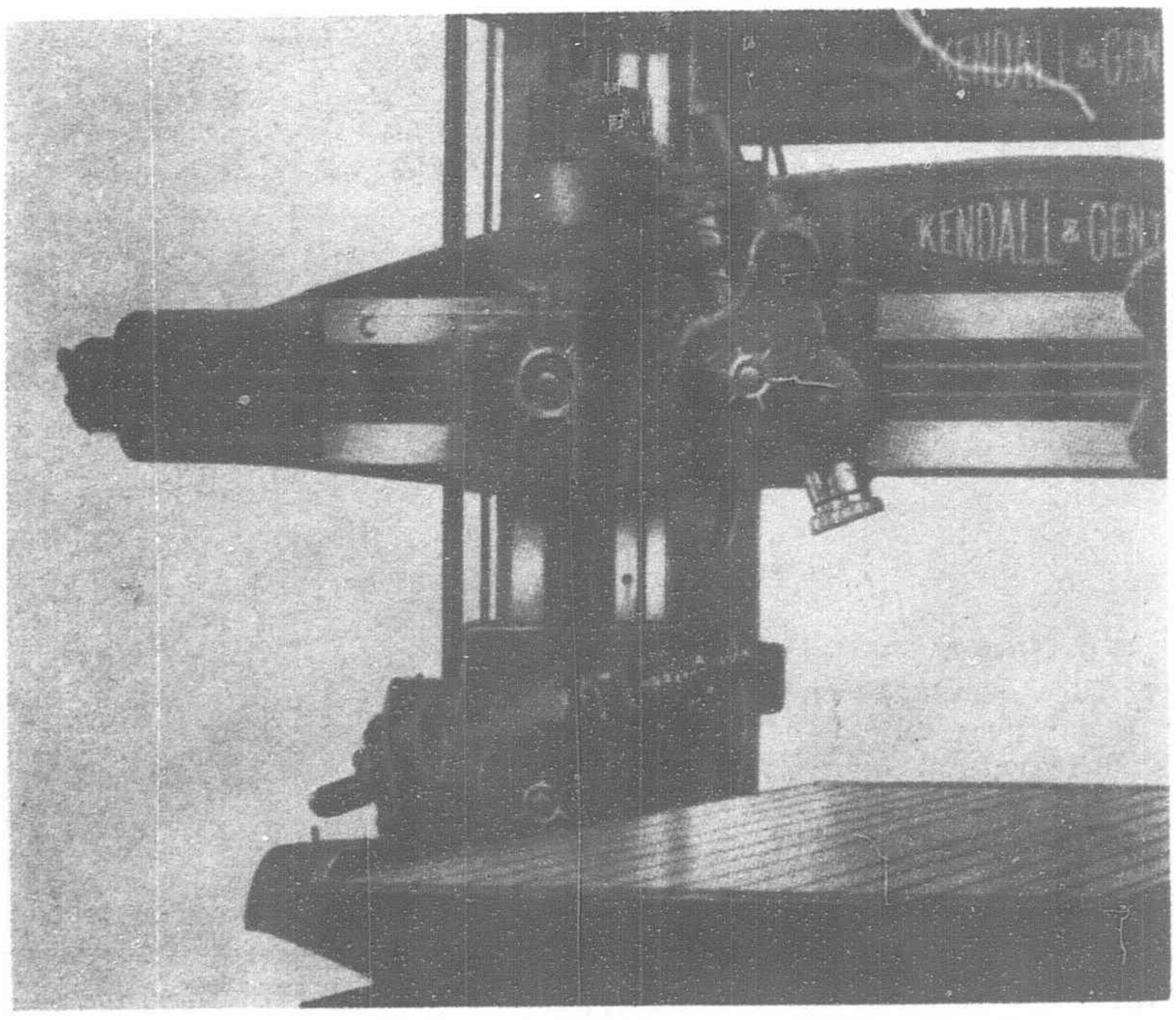


Fig. 6.—The Left Hand Saddles in a Swivelling Position

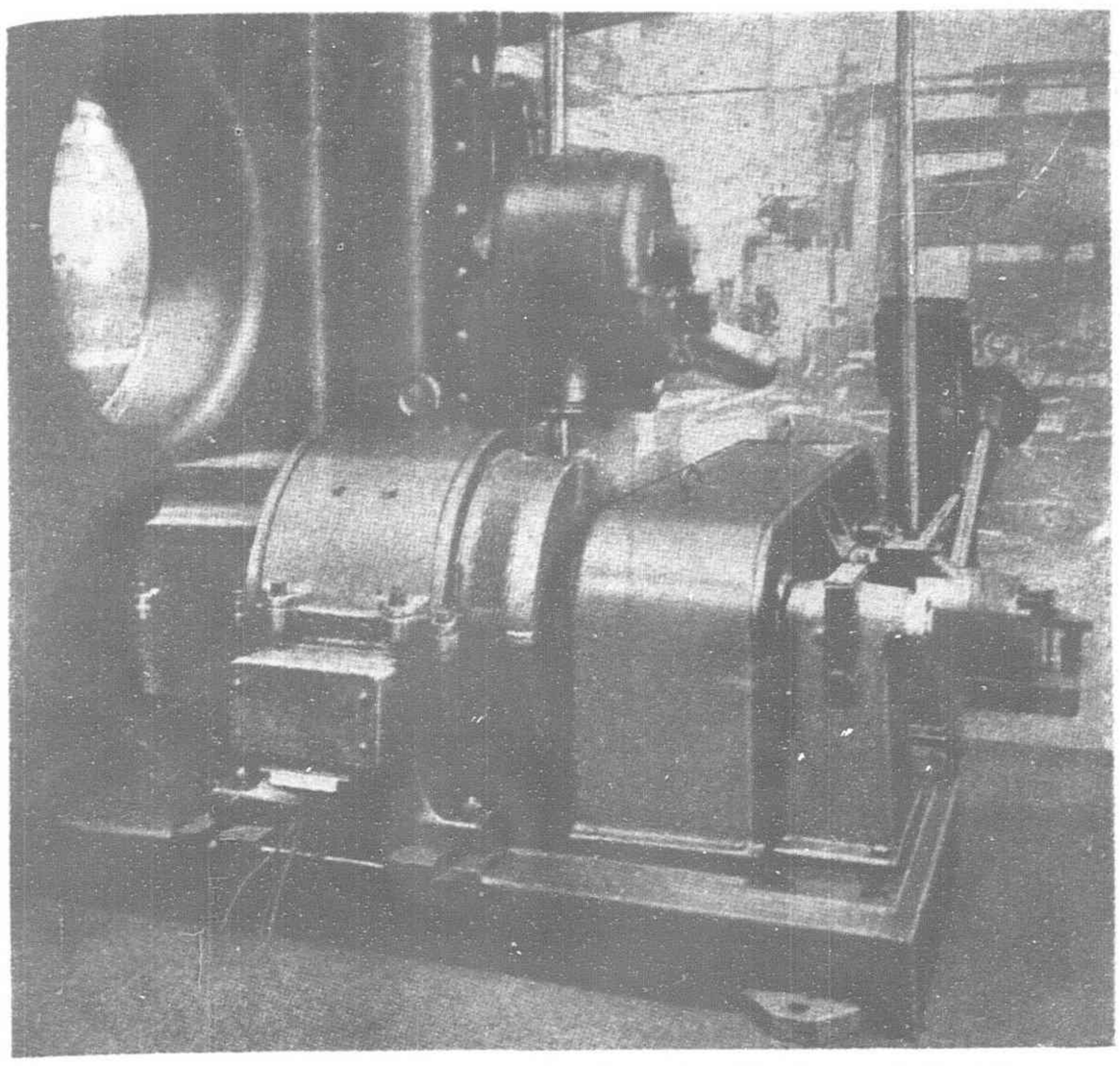


Fig. 7.—A 60 h.p. motor for driving the Horizontal Saddles

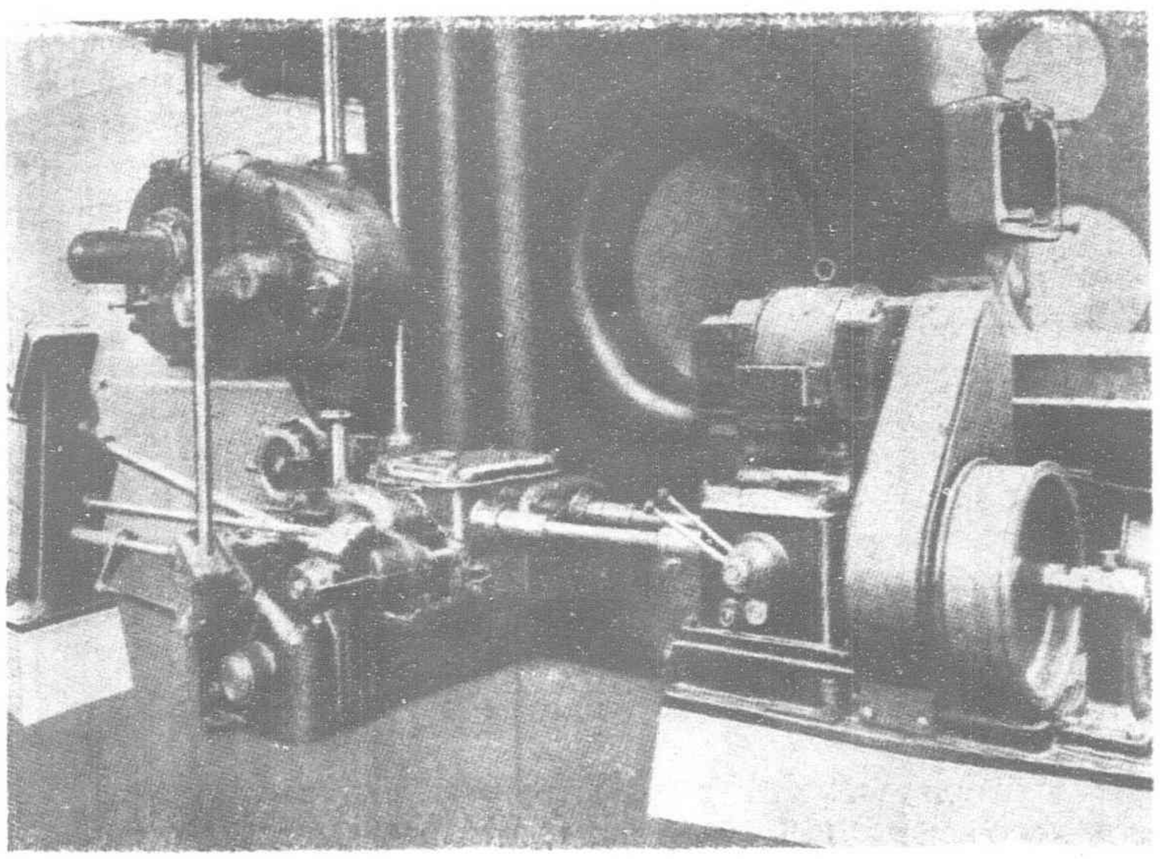


Fig. 8.—A 20 h.p. motor coupled to Feed Gear Box

various motions of the machine, enabling the operator to start, stop, inch and reverse, every motion from the normal operating position without the least exertion.

Although this machine is of unusual dimensions, it will be readily appreciated that similar designs of machines, but of smaller capacities, can be supplied to suit clients' particular requirements.

Pure Nickel Coinage for Japan

THE Financial Ministry of the Japanese Government is submitting to the Imperial Diet a bill calling for a revision of the present Coinage Law in order to effect the striking of the present 5 sen and 10 sen "nickel" coins in pure nickel. The authorities decided upon this step at the first coin conference in five years held in Tokyo last September.

The step is proposed by the authorities in order to prevent forgeries. At present some 60,000,000 worth of 10 sen and 5 sen nickel coins are in circulation in Japan. Those so-called nickel coins are struck in copper-nickel alloy of the following percentages :

Copper	75 per cent
Nickel	25 ,, ,,

The striking of these coins in pure nickel is proposed to avoid forgeries, as pure nickel coinage requires high temperature.

Natural hardness of pure nickel serves to give distinct engravings. These factors, joined with the strong magnetic power of pure nickel, will help the authorities to distinguish between the counterfeits and government-made coins.

The authorities expect to obtain designs of the new pure-nickel coins from the public at large by offering special prizes.

On the subject of pure nickel coinage Mr. James A. Rabbitt, Consulting Engineer and Adviser to the Japan Nickel Information Bureau, says the first known use of nickel in coinage was made by the Grecian King of Bactria. This is authenticated by a coin in the British Museum bearing the effigy of King Euthydemus II, who reigned in 235 B.C., which is composed of the following elements :

Copper	77.585 per cent
Nickel	20.038 ,, ,,
Cobalt	0.544 ,, ,,
Iron	1.048 ,, ,,
Tin	0.038 ,, ,,
Silver	Trace
Sulphur	0.090 ,, ,,

It is assumed that this alloy was not manufactured by fusing isolated quantities of nickel and copper, but was obtained from a natural alloy derived by direct smelting of a complex ore. As there are no known deposits of nickel sulphide ores near the region the Bactrians inhabited, the theory has been advanced that this metal came from China, as it is a matter of common knowledge that the Chinese, as long ago as the Han dynasty (221 B.C.—A.D. 25), and probably earlier, manufactured alloys from copper nickel ore called "Pei-tung" (white copper), which consisted of copper 79.4 per cent —nickel 16.02 per cent—iron 4.58 per cent.

The sulphide ore from which pei-tung was obtained was known to have been mined and smelted in the provinces of Yunnan and Szechwan. It is also recorded in ancient Chinese annals that an overland caravan route between China and Bactria was in existence in the early part of the second Century B.C.

Two thousand years elapsed before nickel alloy was again employed for coinage purposes. This time it was by Switzerland, under its coinage Law of May 7, 1850.

In the United States nickel alloy coinage was adopted in 1857 ; in Belgium in 1865—both with the ratio of 75 copper to 25 nickel.

Jamaica adopted nickel alloy coins in 1869 (80 per cent copper—20 per cent nickel), Germany in 1873 (75 to 25), and in 1908 its 25 pfennings were made of pure nickel. Austria-Hungary adopted pure nickel in 1892 ; Italy and France in 1893. In France the pure nickel, authorized to be used in 1913, was withheld on account of the war, but in 1917, 75 per cent copper to 25 per cent nickel was authorized ; British India adopted copper nickel coins in 1908.

Canada adopted pure nickel in 1921 ; the Irish Free State did the same in 1929. Other countries that have adopted nickel alloy coinage in some forms are :

Bulgaria, Crete, Czecho-Slovakia, Danzig, Denmark, Esthonia, Finland, Greece, Jugo Slavia, Latvia, Luxemburg, Montenegro, Netherlands, Norway, Poland, Portugal, Roumania, Serbia, Sweden, Turkey, British North Borneo, Dutch East Indies, French Indo-China, Japan, 5 sen (1889), 10 sen (1920), Kiao Chau—5 and 10 cents—(1909), Korea in 1902, besides others, including 26 countries in Africa and South America.

Pure nickel is the only metal which satisfies all of the requirements. As a result of a test made by the Swiss Government toward the close of the World War, the wearing quality of pure nickel was found to be five times that of copper nickel and 10 times that of silver copper. As the cost of pure nickel is only 60 per cent greater than that of copper nickel, obviously it is more economical to use pure nickel. This fact, in addition to the difficulties of counterfeiting nickel, due to its high melting point and toughness, and also due to the fact that nickel is the only coinage metal which is highly sensitive to magnetic attraction, makes it the ideal metal for coins.

A few words given to a consideration of the broad principles on which the preference for this type of money is based will not be out of place.

It is fairly safe to assume that but for the late war the more important countries on the Continent of Europe would by now have adopted pure nickel for all token coins of nominal value ranging between approximate equivalents of one penny to three pence or even to six pence, for coinage authorities were then, as now, almost unanimously in agreement that no other base metal equally well fulfils the several requirements of a token currency. These requirements may be summarized under five headings: (1) Durability ; (2) Lowness of price ; (3) Sightliness ; (4) Security against counterfeiture ; (5) Cleanliness. Pure nickel is the only metal which fully satisfies all these requirements.

The Graveyard of the Ships

Writer Tells How Japan is Breaking Up Old Vessels

By EISABURO KUSANO

On the shores of the Shirinashi-gawa, one of the rivers emptying into Osaka Harbor are the Yards where old vessels are taken to be scrapped

WHEN two White Star liners, the *Baltic*, 23,884 tons, and the *Megantic*, 14,878 tons, which carried a large number of Canadian and American troops across the Atlantic during the War, sailed from Liverpool for Japan about the middle of February, 1933, to be scrapped in Osaka, the event was viewed with skepticism and alarm by shipping circles in London because of the strained situation in the Far East, according to the *Osaka Mainichi*. Rumors were circulated, said the cable from London, that these old time liners would be converted into naval transports or made into warcraft upon arrival at Japan.

Such an apprehension was not altogether without reason. During the first two months of 1933, the Japanese old ship importers concluded negotiations for 25 ships, 175,000 tons (gross). Out of the total of these 25 ships, 11 ships, aggregating 73,000 tons, built in between 1918 and 1920, are to be operated by Japanese shipping concerns upon their arrival in Japan and one of them is to be converted into a floating factory. While the remaining 14 ships, including a tanker, amounting to 112,000 tons are to be scrapped. This is certainly a heavy transaction for two months. It is remarkable that many of them are to be added to Japan's mercantile fleet in active service, considering that Japan has long stopped buying second hand ships except for scrapping.

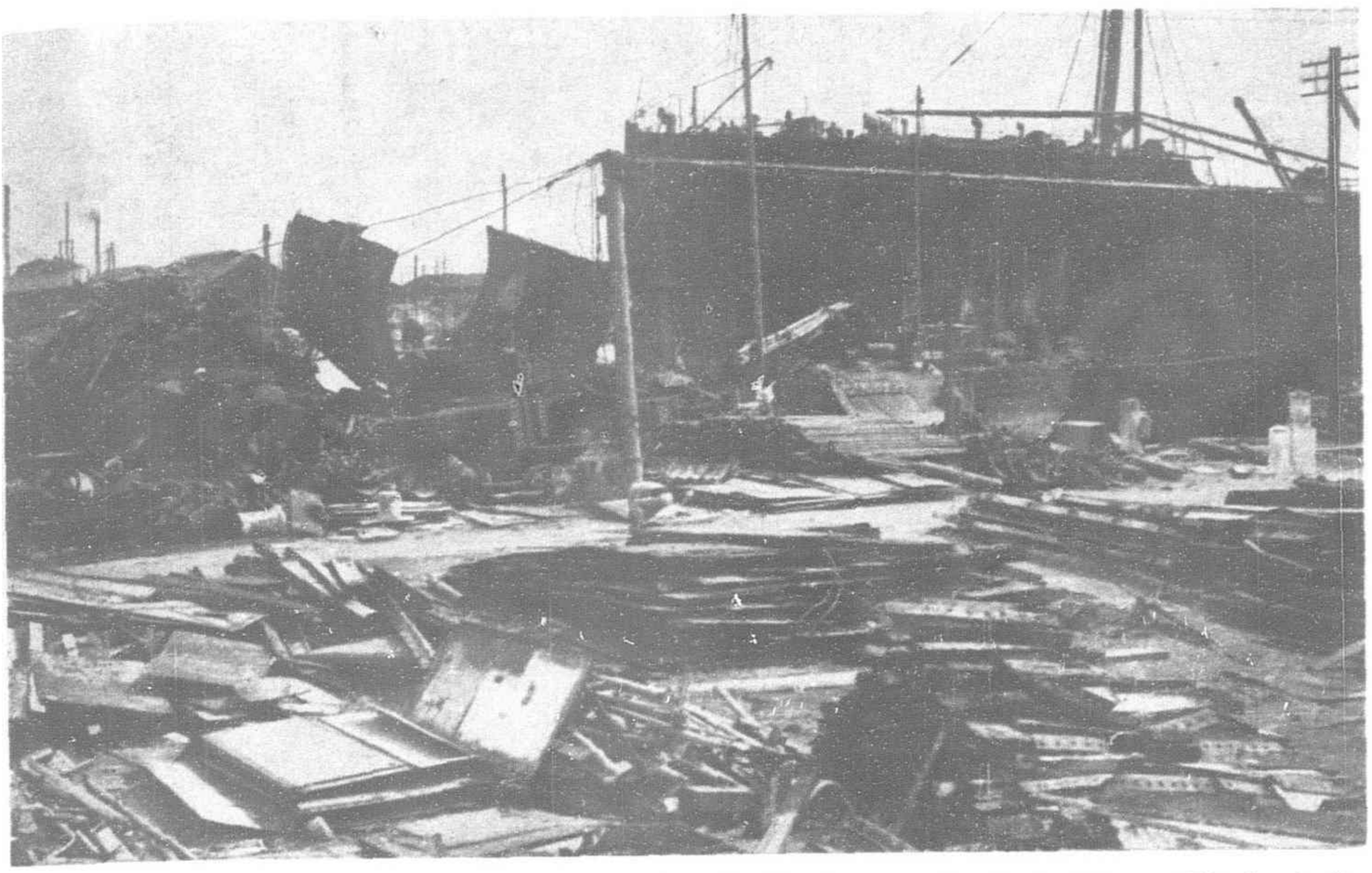
It is now known, however, that the sudden revival of the import of ships other than those to be reduced to pieces resulted from the plan of transporting Manchurian soya beans to Europe, and that the Dairen Steamship Company and the Yamashita Steamship Company are mainly financing the enterprise. As regards the 112,000 tons to be taken to pieces, it is also explainable by two major economic reasons, viz., the sharp advance in the market quotation of iron in Japan and the special construction project now under way.

This special building program in Japan requires a little explanation. Japan is about to replace 400,000 tons of worn-out steamers by 200,000 tons of new ocean-going freighters. The construction and the scrapping are inseparable in this scheme by virtue of the subsidy law which was promulgated and took effect immediately after the 63rd session of the Imperial Diet that convened in the summer of 1932. In accordance with this subsidy law, the Government subsidizes, on the average, Y.50 per each new ton, on condition that old vessels of twice as much tonnage are either scrapped or removed from the ship's register and decommissioned altogether. The law is to cover the construction of 50,000 tons in 1932-3, 100,000 tons in 1933-4, and 50,000 tons in 1934-5.

It is primarily to improve the quality of Japan's merchant fleet in general and simultaneously to regulate the space supply that this subsidy law has been enacted. At the time when the law was drawn up, Japan's shipping was suffering from acute depression, so much so that the disposal of some of the old tonnage appeared to be imperative. The dismal fall of the yen exchange rate, however, has changed the situation completely. As soon as the subsidy bill became a law, the market price of old ships in Japan quickly advanced. Moreover, the depreciation of the Japanese yen enabled a considerable tonnage of ocean going ships to leave for overseas markets after remaining in home waters for many months. One of the primary purposes of regulating the space supply at home was thus answered too soon by the depreciation of yen, it stimulating, in addition, the market quotation of ships to rise still higher. It has become even difficult now to obtain old ships to be scrapped in order to fulfil the conditions of obtaining the subsidy for construction.

Mention must also be made of the fact that most of the Japanese ships are smaller in type with a result that several of them have to be scrapped to build one new ship of medium size under the subsidy law. From the standpoint of the scrappers, who want iron, moreover, foreign ships are preferred as they are relatively new and their upkeep is generally better as compared with the Japanese ships. It is under such circumstances that the Japanese shipping concerns and scrappers have concluded business for importing 25 ships in the short period of two months.

Other views of the Ship Scrapping Yards on the Shirinashi-gawa at Osaka where all kinds of junk are stripped from scrapped vessels and are seen lying about in astonishing disorder



Moored to the river bank awaiting scrapping is the former P. & O. Liner "Kashmir," which was reduced to fragments in the autumn of 1932

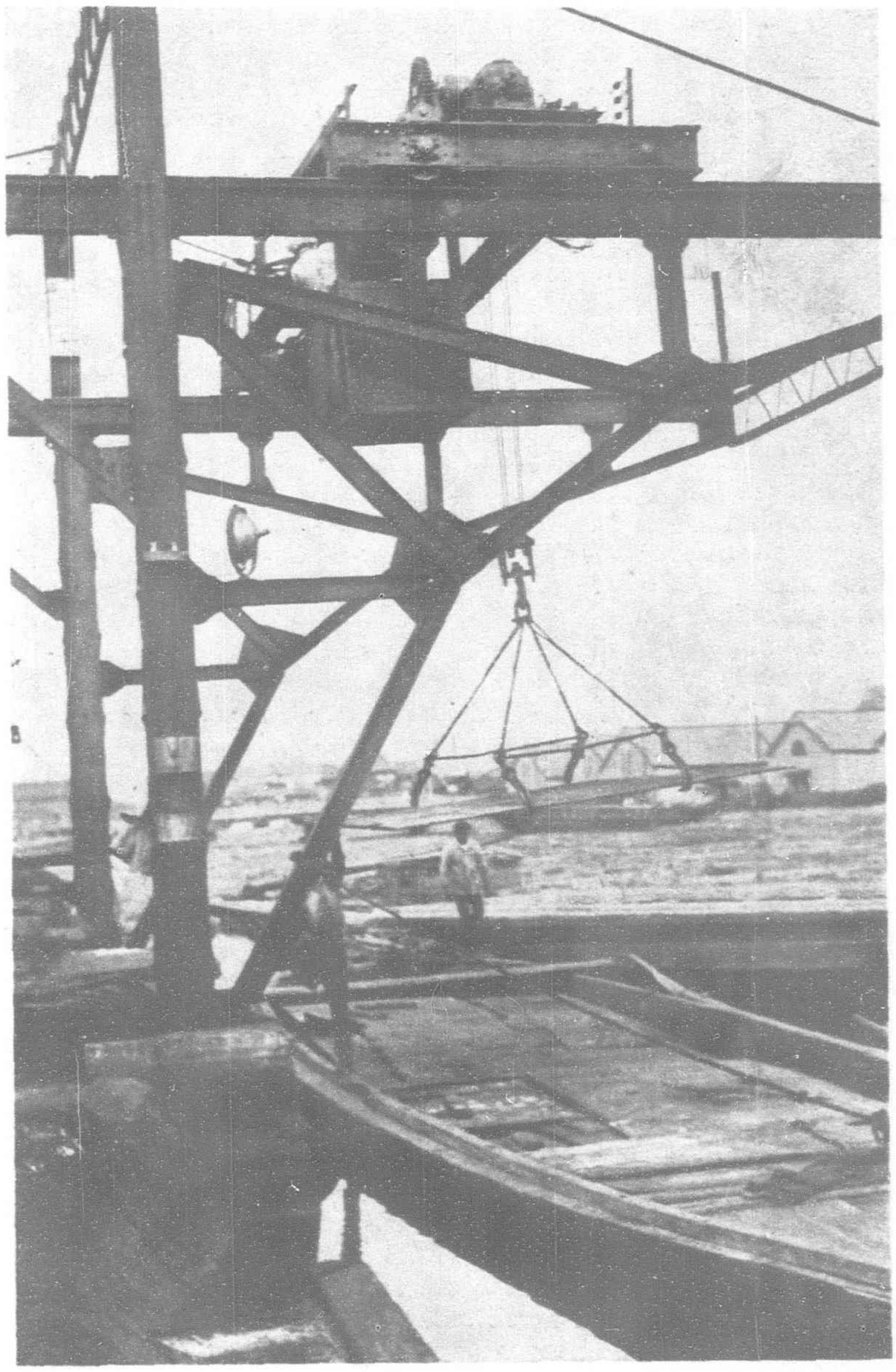
World Ship Scrapping Center

Scrapping old ships in Japan is one of the most rationalized enterprises in the world, and Osaka is considered the world center of this peculiar industry. Japan has torn down almost 800,000 tons of foreign and Japanese steamers during the past 10 years. In 1931, alone, the total tonnage knocked down amounted to 255,000 tons, as seen in the accompanying table. (Note : ships of under 1,000 tons and those constructed of wood are not included : the age and the prices listed below are the average for the respective year)

Years and Registry	*Number*	*Tonnage (gross)*	*Ages*	*Price (per ton)*
1922 :				
Foreign	1	4,364	33	Y.18.30
Japanese	1	2,252	42	28.80
1923 :				
Foreign	3	11,904	33	20.60
Japanese	3	7,854	41	19.30
1924 :				
Foreign	0	0	0	0
Japanese	2	4,940	42	19.30
1925 :				
Foreign	2	13,270	23	22.95
Japanese	9	34,163	37	20.83
1926 :				
Foreign	6	32,568	26	23.48
Japanese	1	4,378	34	25.10
1927 :				
Foreign	13	50,613	29	22.80
Japanese	3	9,503	40	22.45
1928 :				
Foreign	9	52,481	26	25.50
Japanese	6	18,488	39	22.55
1929 :				
Foreign	18	92,810	27	26.25
Japanese	8	21,563	44	22.75
1930 :				
Foreign	10	66,152	24	20.34
Japanese	14	37,438	42	16.73
1931 :				
Foreign	41	215,273	26	12.96
Japanese	11	39,992	37	12.10

This breaking up of old ships in Japan is one of the post-war industries. One or two ships were scrapped in this country even as early as 1897 and about a dozen ships were reduced to pieces during the depression that prevailed in Nippon in 1908-9. But the industry came to sudden prominence after the discovery, toward the end of the World War (1917-8), of the simple device of rolling iron plates, that were stripped off the hulls of ships, directly into rods and squares of small measurements without going through the process of reproduction via the melting pot. This process is locally called "shin-tetsu," literally meaning "stretching iron." It is a primitive method invented by sheer necessity when Japan suffered severely from a shortage of iron building materials. It was started in Osaka after various experiments.

It is entirely on account of the existence of this simple industry of iron rolling that the Japanese scrappers are able to make both ends meet even when they buy ships in competition with foreign rivals in Europe and have the ship sent all the way to Japan at an enormous cost. For some kinds of scrap plates suitable for this peculiar industry are always dealt in at considerably higher prices than ordinary scrap iron which must be thrown into the cupola.



Scrap plates with the rivets knocked off are transported to the Iron Rolling Section and elsewhere via the Canal, then are cut into billets which after heating are fed into rollers to make of them rods and square building bars

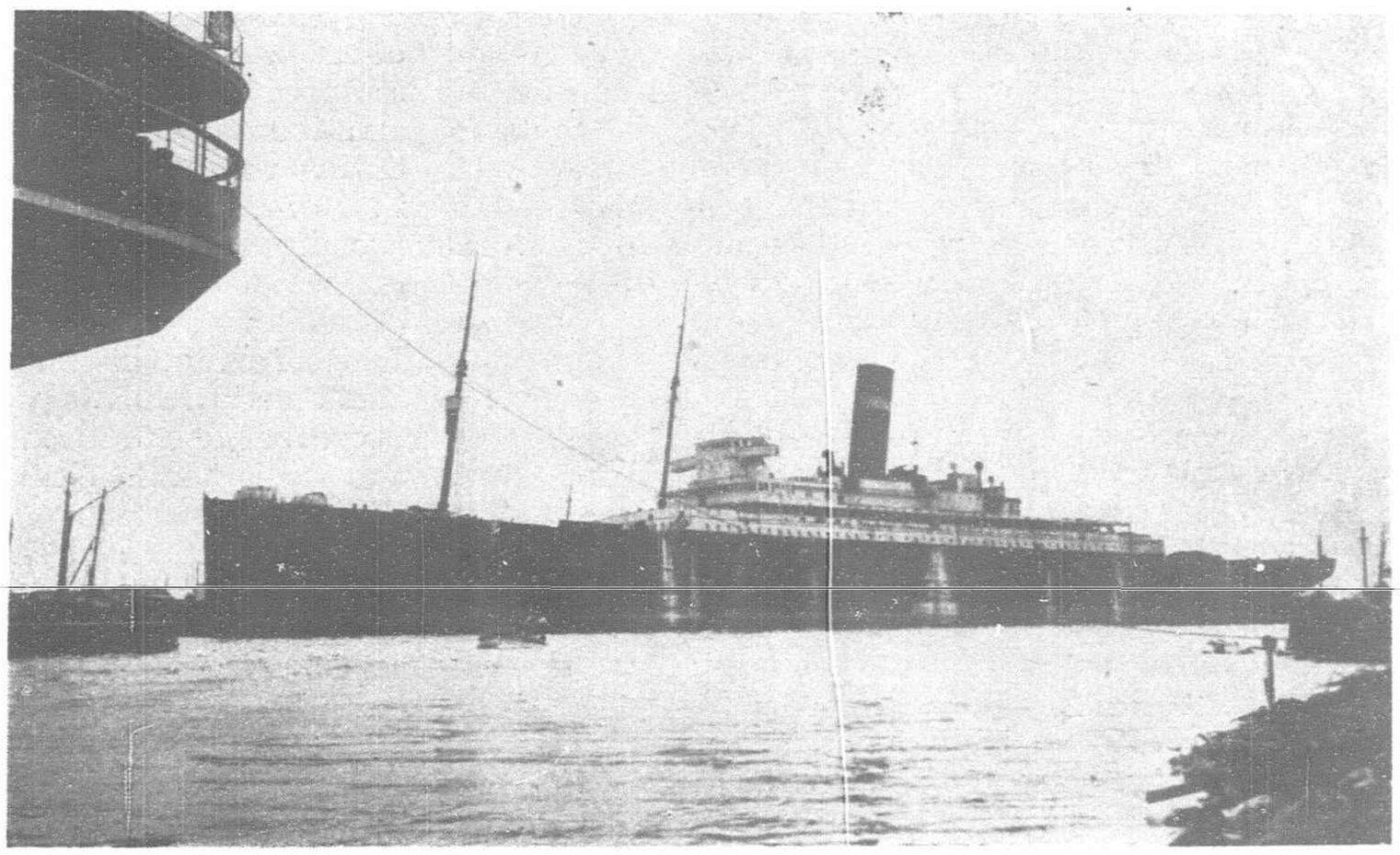
To explain the process briefly :

Simple Iron Rolling

When a ship is scrapped, the iron plates that have the proper thickness and are in good condition are cut into " billets," about three or four feet long and about five inches wide. A billet is put into a furnace where it is heated red hot. The sparkling billet is then fed to the roller. The roller consists of a set of two heavy pins nearly 10 feet long with a diameter of about two feet. Each one of these roller pins has corresponding grooves of different measurements, large and small. Usually there are two sets of these rollers standing side by side with the furnace. And two men, standing on either side of the roller, attend to the business of feeding the hot billets to the roller. When the billet is fed into one of the large grooves, the iron pours forth on the other side, its length extending. The man standing on the other side then catches it with an iron rod, the tip of which is bent like a sharp letter V., and deftly feeds it back into another groove of narrower gauge.

As the process of feeding the billet to the roller is repeated over and again from larger grooves to smaller ones, the red hot iron goes across the roller back and forth, meanwhile stretching and stretching in length, until it is finally rolled into a rod having one of several diameters of less than one inch or into a square bar of similar sizes.

But for the iron rolling, all the scrap iron would have to be melted in the cupola. The molten iron would then be permitted to cool into ingots. The ingots would again be heated and rolled into billets. The " shin-tetsu" enterprisers, on the other hand, cut these billets direct from the plates stripped off the ships, without going through the process of melting, cooling, and heating to roll into billets. This process of reproduction is omitted altogether. And, to go through such a process of reproduction requires a tremendous sum of capital as the peculiarity of the business necessitates its being conducted on a mass production basis. As for the "shin-tetsu" operation, however, it can be inaugurated by a much smaller investment. There is no comparison between the two. And so, the Osaka and Tokyo "shin-tetsu" companies together turn out approximately 100,000 tons of iron building materials annually.



Here is the one-time Proud Dutch Passenger Liner, "New Amsterdam" when scrapping of the vessel was being begun. Note that the mizzen mast is gone

Another strong point of the " shin-tetsu " business is that it is adaptable to the ever-changing situation of the market. Because of its being run on a small scale, the operation can always be readjusted to meet the immediate needs of any specified goods under a certain limit in measurements at short notice and also it can satisfy demands for small quantities.

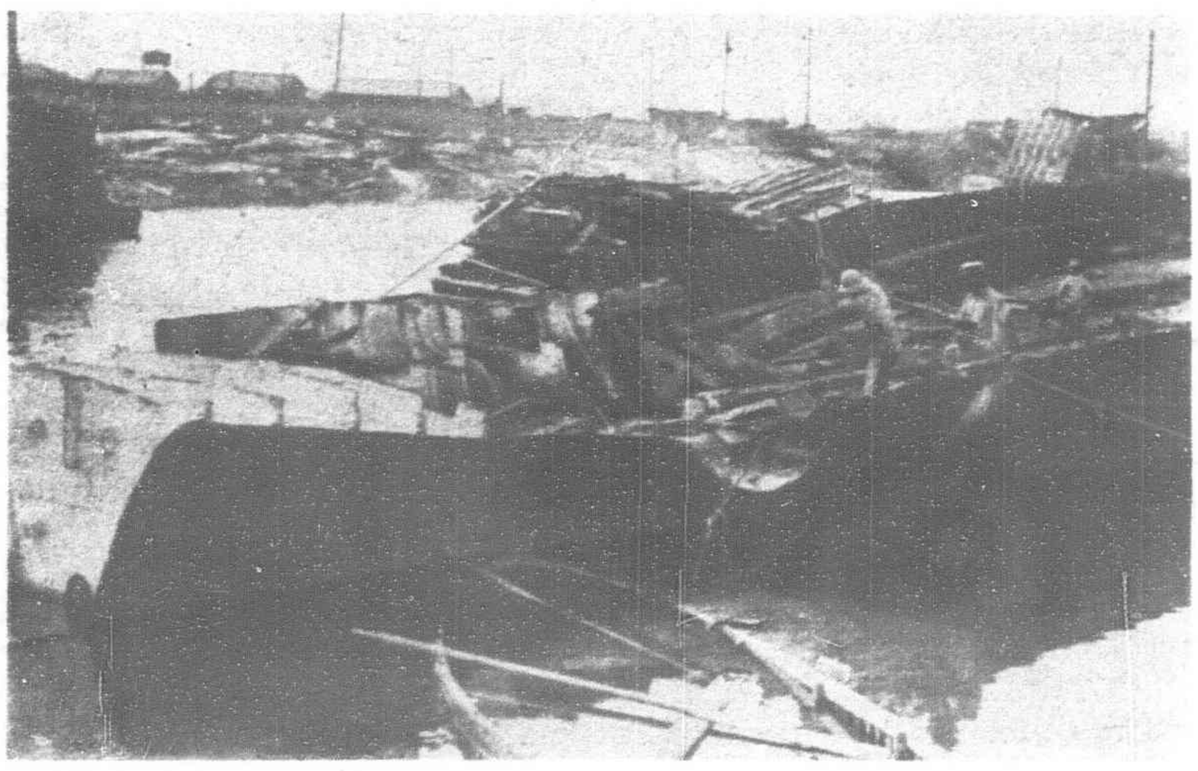
It depends much upon the upkeep of an individual ship broken up and besides it is a trade secret jealously guarded, but an Osaka scrapper said that on the average about 25 per cent of the entire iron material obtained by scrapping a passenger boat may be used for iron rolling and that this percentage somewhat increases in the case of a cargo boat. Some of the large ship scrappers undertake the iron rolling as well but it is generally run separately by different companies. As for the scrapping ships, the method adopted is more simple and primitive than the iron rolling.

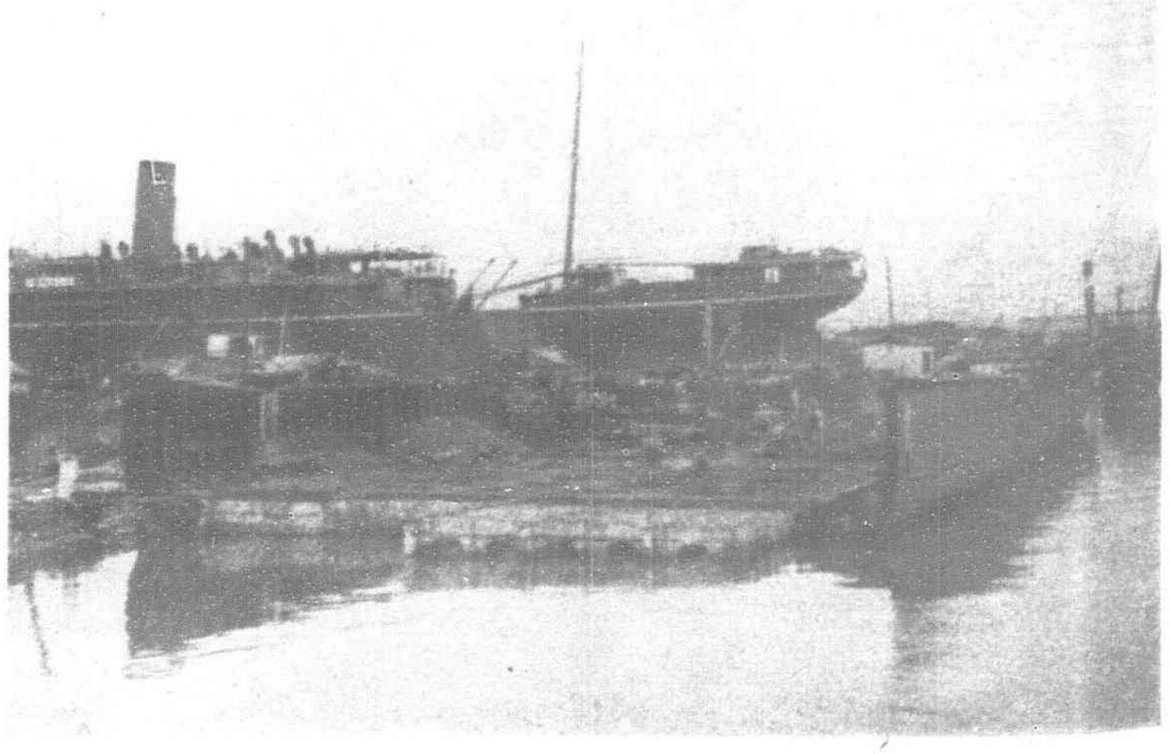
How Ships are Scrapped

When an Osaka breaking-up specialist buys a ship and has it brought to the harbor—a scrapper generally closes the deal c.i.f. Osaka, for he cannot " afford the risk" of having the ship sent to Osaka on his own account—its furniture and belongings, inclusive of all the desks, tables, chairs, sofas, curtains, rugs, tablewares and what not, as well as the navigation instruments and tools are put up at auction. The income through the auction sale of these fittings, important as it is, does not constitute the principal item of the scrapper's account ; his interest is concentrated on the scrap plates obtained by tearing down the ship.

Stripped of its equipment, the ship goes up the Shirinashigawa, one of the many rivers emptying into the harbor, to a section where all the scrapping yards in Osaka are grouped together. Here, the ship is moored to the river-bank in front of the spacious scrapping yard and the work of tearing down begins.

There is no particular order. If the masts are among the first things that are cut off, it is simply for the sake of convenience. The work generally begins at the top, going all the way down. Sometimes the funnels remain untouched for a long time until it becomes convenient to remove them by the roots. When all





In the above pictures the former P. & O. Liner "Kashgar" is nearing the last stages of scrapping. When the work progresses to the water line, what is left of the hull will be drawn into the Open Yard where the final cutting takes place

the superficial structure of a ship is gone, men with torches begin cutting the decks and sides. Sections are cut off in blocks of from 30 to 40 tons and are carried away by a floating crane. These blocks, when landed, are further cut into still smaller slices. Then a bunch of sturdy men knock off the rivets with heavy hammers. After the rivets are removed, some of the better plates are cut by a powerful cutting machine into " billets" which are rolled into building materials. The breaking up of a ship is a slow process. It generally takes from four to six months before a ship is completely scrapped. It goes without saying that the task is easier when handling a cargo boat than a passenger ship.

When a ship is sliced block by block nearly to the water line, the remainder of the hull is then drawn into an open yard where it is propped up and the final cutting to pieces of the bottom takes place.

As for gigantic engines, they are also dismembered and handled as scrap, unless of course the scrapper succeeds in selling them to a shipbuilder. When engines are saved, import duties are imposed, but otherwise they are duty free. There are about 10 companies that undertake ship-scrapping in Osaka and two in Tokyo and no more. But they claim that Japan leads the world in this particular line which is also followed in Italy, Germany, and Denmark.

Tokyo's Water Supply Project

(Continued from page 114)

Tokyo is one of the few metropolitan centers in the world that provides its inhabitants with filtered water. Notwithstanding the purity of Tokyo's water through filtration, processes of sterilization are carried out, especially when epidemics are prevalent. Chlorination apparatus is installed both at the Sakai and Yodobashi stations.

Residences to the number of approximately 420,000 in the former city were served by the city waterworks bureau. The Tokyo Imperial University, the Tokyo Fish Market in Kyobashi Ward and the Shinagawa railway station can boast having the three taps that draw the most water each month from the municipal supply. The greatest volume of water, however, is consumed by park fountains and recreation places. Hibiya park in Kojimachi Ward, the Zoological gardens in Ueno park and Hanayashiki in the ward of Asakusa, head the list. Next to these come the Mitsukoshi department store, in Nihombashi, the Shibaura Engineering Works, in Shiba, and the *Tokyo Asahi Shimbun* (newspaper), in Kojimachi.

In a check up over a period of 15 years it was calculated that six per cent of the water consumption of Tokyo goes for drinking purposes and 10 per cent for sanitary requirements of various kinds.

The price of Tokyo water is .093 sen for 36 cubic feet (one cubic meter) or .93 sen for 360 cubic feet (10 cubic meters). This is about one-third more than is charged for water in Osaka and some other large cities within the Empire ; but the purity and palatability of the water may, perhaps, make up for the higher cost.

Savage Gold

(Continued from page 133)

holding the bird with both hands, he pressed its wounds against his forehead, and then released it. Stupefied, terrorstruck, the bird fluttered down on the tunnel rails and lay still, but suddenly realizing its freedom it fled, cackling and flopping its wings. The men followed as fast as theyc ould. Right for the mine opening it sped, and when it at last reached bright daylight and still continued to run up the hillside, the old man chuckled with satisfaction.

"Now my boy will be all right. The *anito* has left the mine forever."—According to Mr. Montague the sick boy recovered rapidly.

Down at the mill, a mile further down the canyon, the ore is ground and twice a month the extracted gold is melted and poured into bullion. First now it becomes a marketable product ; it can now be shipped to the United States to be refined and coined.

The appearance of the gold after it had been extracted from the ore by cyanide, is very disappointing. There is very little romance in those dirty, brown, slag-looking lumps. It has no resemblance to the much coveted precious yellow metal we all know well. It is thrown into the roaring oven and the glowing mass is then poured into cones. The gold has now recovered some of its metallic lustre. Once more it is thrown into the oven to be melted a second time, when at last, it is poured into molds.

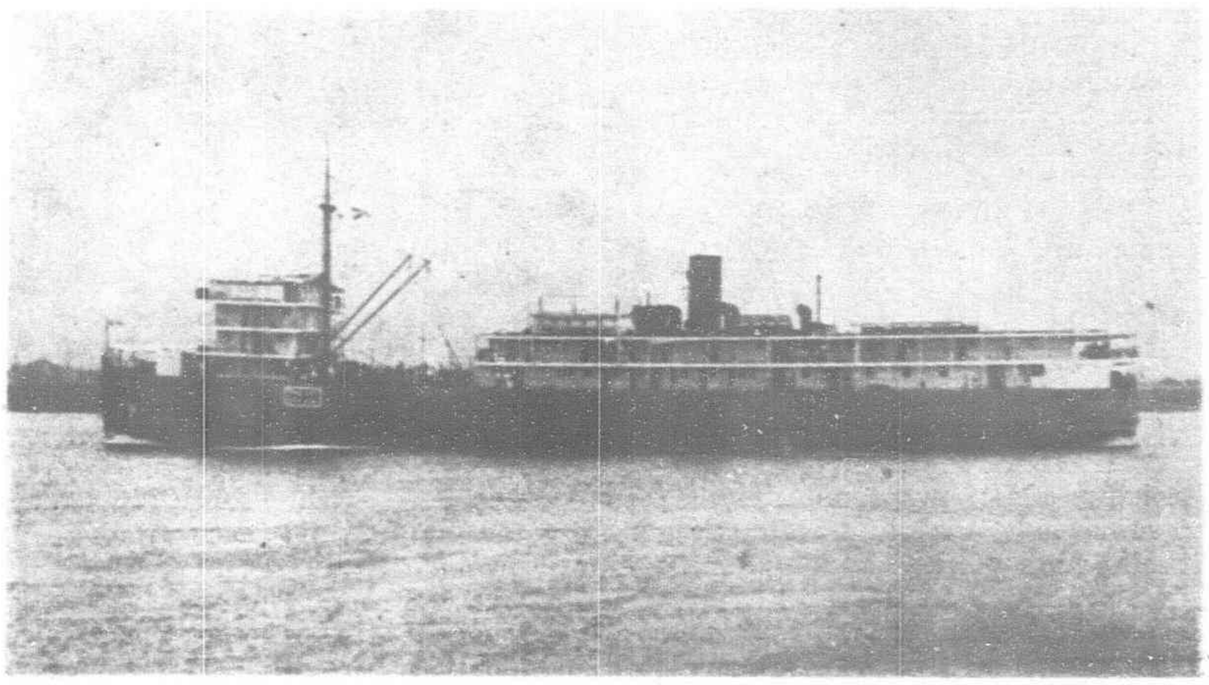
The attendants, their hands protected by asbestos gloves, handle the still glowing, gold ingots without hesitation or difficulty. It seemed to me that as it cooled, the gold again had lost its brilliance, it looked sickly, grey-greenish, like blocks of dusty concrete. Still, they were genuine gold bricks, every one of them, and valued at about $2,000 each, a total of $90.000. And now, at last, they were cleaned, and polished and not until then did they recover their dazzling sheen of real yellow-yellow gold.

Iron Ore in Malaya

The biggest Japanese iron-ore mine in Malaya is owned by the Nippon Mining Company, who operate at Kuala Dungun near the coast of Trengganu. But their output, about 200,000 to 300,000 tons per year, is not the largest among Japanese interests in Malaya. Isihara Sangyo Koshi, Limited, have been mining in Malaya for twelve years, and operate at Batu Pahat, from where they export something like 500,000 tons per year to Japan, and at Kuala Dungun, Trengganu, also, where the production figures are in the neighborhood of 30,000 tons per year. Much is expected of the iron deposits, acquired recently by the Tochigi Shoji Kaisha, of Kobe, on the upper forks of the Muar River, emptying into the Johore Straits. These deposits, which are estimated to run into tens of millions of tons, are said to be remarkably rich in their percentage of iron, containing as much as 65 per cent. The company is also interested in a hitherto unknown iron ore field in Kedah.—*Eastern Engineering and Commerce.*

New Motorship "Wusueh"

The China Navigation Company has put a twin-screw passenger and cargo boat in service on the Yangtze, for running between Shanghai and Ichang, about 860 miles up the river. The vessel is propelled by two 875 b.h.p. Sulzer two-cycle Diesel engines, which give it a speed of 11½ to 12 knots. The vessel, which was built at Taikoo dockyard Hongkong, is 295-ft. long, 48-ft. broad and 21-ft. deep to the upper deck ; it has accommodation for 42



Butterfield & Swire Passenger and Cargo Boat "Wusueh" Propelled by two Sulzer 2-Cycle Diesel Engines having 1,750 b.h.p. at 210 r.p.m.

saloon passengers, 36 first class passengers and 144 steerage. The vessel has a straight stem and a rounded stern, twin balanced rudders, and steel mast, two continuous decks, *i.e.* main and upper, with a boat deck above the after part of the upper deck, and a roof deck over the boat deck. Forward of the mast is a bridge deck. There are two cargo holds forward and also a hold suitable for carrying either oil in bulk or general cargo. Another cargo hold is aft.

Engineering Notes

INDUSTRIAL

BAUXITE FOR JAPAN.—According to reports from Holland, good progress is being made in connection with the negotiations for the establishment of a bauxite industry on the island of Bintam, in the Dutch East Indies. It is hoped to find a market in Japan, where a scheme is on foot for the establishment of an aluminium industry with the support of the State. The Japanese import about 10,000 tons of aluminium from the United States per annum, but it is desired to become independent of this source.—*Electrical Review.*

PROJECTS IN MANCHUKUO.—Plans for new industries have received formal approval of the South Manchuria Railway Company. First is the foundation of an aluminium industry, which has been under discussion for two years. Factories are to be started at Mukden or Fushun before the end of the year. The cost of the project will be about Y.10,000,000. The directors on September 20, also made final decision with regard to ammonium sulphate, and a company with a Y.25,000,000 capitalization will be incorporated shortly. Work will be started in April, and will be completed in two years. According to the plan, the annual output of ammoniates will be 170,000 tons.

CANTON IMPROVEMENTS.—Preparations are under way for carrying out of the Greater Canton project providing for new elaborate road and drainage systems. Plans approved by the Municipal Government, to be carried out at once, give the city new commercial, agricultural, residential and amusement areas. The projects also calls for the construction of new tramway lines, aerodromes, railway stations and maloos. Considerable interest is being drawn to the tramway project. Despite its large size Canton is without a tram service. A tramway covering many of the principal thoroughfares was laid over ten years ago, but on account of a dispute between the company and the government, the service has never been inaugurated.

RATIONALIZATION IN JAPAN.—Schemes for the rationalization of practically every branch of industry in Japan are reported. One proposal affecting the electrical machinery market concerns the control of the Shibaura, Fusi, Mitsubishi and Hitachi Works, while another scheme relates to the Japan Electric, the Oki Electric, and the Adachi Electric Machine Companies. Upon the advice of the commercial and industrial authorities the Tokyo Electric Lamp Industrial Guild is taking steps to control the electric lamp industry, and various schemes of co-ordination are being drawn up. The establishment of a national federation of electric lamp manufacturers is considered probable, but it is possible that a national sales company may be formed.—*Electrical Review.*

SHANGHAI EXPANSION.—The Nanking Ministry of Railways is planning to construct short branch lines in Greater Shanghai for the development of the municipal area. An order to the Nanking-Shanghai and Shanghai-Hangchow Administration instructs that survey operations be started immediately and an estimate of cost prepared for the construction of feeder lines linking Chenju and Jessfield ; Chenju and Kiangwan ; and Kiangwan station and Jukong village on the bank of the Whangpoo River area.

To expedite the construction of the new railway station at Shanghai which is to take the place of the North Station bombed by Japanese aeroplanes during the Sino-Japanese hostilities, officials of the Ministry of Railways have consulted with the Municipal Authorities regarding the expropriation of land. As construction work on the new station at Chenju would take some time, a temporary station will be built on railway property near the Sung Chiao-jen Gardens in Chapei.

RAILWAYS

TRAMS FOR NANKING.—Three routes have been mapped out by the Reconstruction Commission as the beginning of a tramway system for Nanking. The routes will traverse the busiest sections of the city. The tram lines will be laid down in three stages at a cost of approximately 13 million dollars. The Reconstruction Commission of Nanking has addressed a communication to the Trustees in charge of the British Boxer Indemnity Refund requesting a loan of $3,000,000 for the project.

RAILWAY WORK IN CHINA.—Completion of the entire Canton-Hankow Railway within three years, instead of eleven years, as would be required under present arrangements with the Trustees of the British Boxer Indemnity Refund, is under consideration by the Chinese Ministry of Railways. It is learnt that the Ministry is planning to raise the sum of over $30 million necessary for the project by pledging the eleven annual instalments from the British Boxer Indemnity Refund as security for a loan.

LUNG-HAI LINE OUTLET.—With the new harbor at Hsukow, on the Kiangsu coast of China, nearing completion, the Managing-Director of the Lung-hai Railway, is calling for the development of traffic. To facilitate the transfer of freight from the railway to steamships, the Railway Administration has undertaken the development of Hsukow as a harbor, and has constructed an extension of the line from Haichow. The Asiatic Petroleum Company has despatched representatives to Hsukow to investigate possibilities. The eastern extension of the Lunghai Railway will be completed by next spring.

SHIPPING

SHIPPING MERGER.—Keen attention in Japanese Business circles is being centered on the current rumor concerning the amalgamation of two of the leading steamship Companies in Japan, the Nippon Yusen Kaisha and the Osaka Shosen Kaisha. The high authorities of both companies have been in conference discussing concrete measures for such an amalgamation.

BUYING FORMER CUNARDER.—A Japanese firm is stated to be negotiating for the purchase of the former Cunard steamer *Caronia.* The vessel was bought by Messrs. Hughes. Bolckow, ship-breakers, of Blyth, at the beginning of the year. Workmen are now preparing the ship for tests, and the purchase will be dependent on the boilers being found to be in a good state. —*Yorkshire Post.*

CHINESE SHIPPING SERVICES.—Plans for the establishment of new shipping lines are under consideration by the management of the China Merchants Steam Navigation Co. The Shanghai-Haichow service will be resumed shortly. During the régime of the late Mr. Chao Ti-chao the Company, under agreement with the Lung-Hai Railway, maintained a regular freight service to Haichow, which proved to be very profitable, but this service was suspended by his successors. In compliance with requests from the Lung-Hai Railway, it is planned to resume the service immediately in order to meet a keenly felt need. It is understood that the present management has also decided to charter two 3,000 ton vessels for resumption of the service to Amoy, Swatow and Canton. As a result of the boycott against Japanese shipping, foreign shipping companies having regular services to the Southern ports have been doing exceedingly well and cargo has frequently been shutout. Althought he China Merchants had regular sailings to these Southern ports in past years, the service was suspended owing to shortage of seaworthy vessels. It is also understood that the Company is planning a special express service between Shanghai and Hankow.

CHINESE SHIPPING INSPECTION.—Immediate enforcement by the various Chinese Navigation Bureaux of regulations governing the measurement and examination of shipping, already promulgated by the National Government, is ordered by the Ministry of Communications. All steamers owned or chartered by Chinese citizens for navigation in Chinese waters, or between China and foreign countries, as well as foreign-owned vessels operating between Chinese ports according to law or by special permission of the Chinese Government, are subject to these regulations. All other foreign-owned vessels which do not fall under the above category but are subject to the stipulations of Article XV of the Shipping Law are to be similarly measured and examined by the Navigation Bureaux.

COMMUNICATIONS

TOKYO-SEOUL 'PHONE SERVICE.—The Tokyo Department of Communcations plans to open direct telephone service between Tokyo and Seoul, Korea, shortly. One of six cable lines connecting Shimonoseki and Fusan will be used.

WIRELESS TO NANKING.—In order to handle the increasing traffic on the Nanking-Shanghai long-distance telephone line, the Ministry of Communications has decided to instal radio telephone facilities to augment the present service.

WIRELESS TO GERMANY.—Long-distance radio telephony between Shanghai and Berlin will shortly become a reality, it is reported. Replying to a communication from the German Government, the Ministry of Communications has agreed to the proposal for the introduction of radio telephonic communication between the two countries. Experiments will be carried out as soon as installation of the apparatus is completed.—*Kuo Min.*

NEW 'PHONE LINES.—Satisfactory progress is being made in the erection of the two additional lines for the Nanking-Shanghai long-distance telephone service. Wires have been put up as far as Soochow from Shanghai and as far as Chinkiang from Nanking, the entire lines to be completed and open to traffic by New Year's Day. The installation of these lines was ordered by the Ministry of Communications in order to cope with the increase of traffic.—*Kuo Min.*

NEW WIRELESS SERVICE.—Already in contact with most of the world, the Chinese Government Radio Administration announces that it is negotiating with Russia for establishment of wireless communication with the Soviet—a result of the recent resumption of diplomatic relations between the two nations. Several points of contact are being sought which will include services from Moscow, Vladivostok and other leading Russian cities with Shanghai. The Minister of Communications announces that traffic will be started very soon.

CHINESE HIGHWAYS.—The Chinese National Economic Council has agreed to appropriate $200,000 immediately towards the construction of important highways for border defence in the provinces of Honan, Hupeh, Hunan, Anhwei, Kiangsi, Kiangsu and Chekiang. Mr. Chen Ti-cheng, newly appointed Director of the Border Defence Highways Bureau for these seven provinces, who was until recently Director of the Provincial Highway Administration for Chekiang, applied to the National Economic Council for a subvention of a million dollars. As a result of personal negotiations at the Capital, it is understood that the Council has agreed to appropriate immediately one-fifth of the required sum, the balance to be available when subsequent progress is reported.